

PSYCHOSOMATIC MEDICINE

[PSYCHOSOM. MED.]

JANUARY • 1941

VOL. III NO. 1

EXPERIMENTAL AND

CLINICAL STUDIES

IS THE HYPOTHALAMUS A CENTER OF EMOTION?.....	3
Jules H. Masserman	
REPORTS OF PARTIAL FRONTAL LOBECTOMY AND FRONTAL LOBOTOMY PERFORMED ON THREE PATIENTS: ONE CHRONIC EPILEPTIC AND TWO CASES OF CHRONIC AGITATED DEPRESSION.....	26
William Jason Mixter, Kenneth J. Tillotson, and David Wies	
ELECTROENCEPHALOGRAPHIC STUDIES ON THREE CASES OF FRONTAL LOBOTOMY....	38
P. A. Davis	
A STUDY OF STRUCTURAL AND INSTINCTUAL CONFLICTS IN CASES OF HAY FEVER.....	51
George W. Wilson	
SOME OBSERVATIONS ON THE RELATIONS OF EMOTIONS AND ALLERGY.....	66
Leon J. Saul	
REVIEWS, ABSTRACTS, NOTES AND CORRESPONDENCE.....	72
SEX HORMONES AND PSYCHIC CONFLICT—A CASE REPORT.....	72
Edward S. Tauber and George E. Daniels	
A NOTE ON THE INEFFECTUALNESS OF SEX-HORMONE MEDICATION IN A CASE OF PRONOUNCED HOMOSEXUALITY.....	87
Saul Rosenzweig and R. G. Hoskins	
Reviews of Periodical Literature	90
Book Review.....	101

Copyright, 1941, by NATIONAL RESEARCH COUNCIL

PUBLISHED QUARTERLY WITH THE SPONSORSHIP OF

THE COMMITTEE ON PROBLEMS OF NEUROTIC BEHAVIOR

DIVISION OF ANTHROPOLOGY AND PSYCHOLOGY

NATIONAL RESEARCH COUNCIL

EDITORIAL BOARD

MANAGING EDITOR

FLANDERS DUNBAR

EDITORS

FRANZ ALEXANDER

Psychoanalysis

DANA W. ATCHLEY

Internal Medicine

STANLEY COBB

Neurology

HALLOWELL DAVIS

Physiology

FLANDERS DUNBAR

Psychiatry

CLARK L. HULL

Psychology

HOWARD S. LIDDELL

Comparative Physiology

GROVER F. POWERS

Pediatrics

ADVISORY BOARD

PHILIP BARD

CARL BINGER

HERRMAN BLUMGART

E. V. L. BROWN

WALTER B. CANNON

BRONSON CROTHERS

FELIX DEUTSCH

OSKAR DIETHELM

GEORGE DRAPER

EARL T. ENGLE

LOUIS Z. FISHMAN

JOHN F. FULTON

W. HORSLEY GANTT

ROY R. GRINKER

WALTER W. HAMBURGER

LUDVIG HEKTOEN

M. RALPH KAUFMAN

WILLIAM J. KERR

LAWRENCE S. KUBIE

DAVID M. LEVY

NOLAN D. C. LEWIS

KARL A. MENNINGER

ADOLF MEYER

WALTER L. PALMER

TRACY J. PUTNAM

STEPHEN WALTER RANSON

SAUL ROSENZWEIG

LEON J. SAUL

ELMER L. SEVRINGHAUS

EPHRAIM SHORR

DAVID SLIGHT

JOHN H. STOKES

JOSEPH STOKES, JR.

MARION B. SULZBERGER

ALFRED H. WASHBURN

EDWARD WEISS

JOHN C. WHITEHORN

HAROLD G. WOLFF

ROLLIN T. WOODYATT

EDWIN G. ZABRISKIE

CONTENTS OF VOLUME III

VOLUME III, NO. 1, JANUARY, 1941

IS THE HYPOTHALAMUS A CENTER OF EMOTION?.....	3
Jules H. Masserman	
REPORTS OF PARTIAL FRONTAL LOBECTOMY AND FRONTAL LOBOTOMY PERFORMED ON THREE PATIENTS: ONE CHRONIC EPILEPTIC AND TWO CASES OF CHRONIC AGITATED DEPRESSION.....	26
William Jason Mixter, Kenneth J. Tillotson, and David Wies	
ELECTROENCEPHALOGRAPHIC STUDIES ON THREE CASES OF FRONTAL LOBOTOMY..	38
P. A. Davis	
A STUDY OF STRUCTURAL AND INSTINCTUAL CONFLICTS IN CASES OF HAY FEVER..	51
George W. Wilson	
SOME OBSERVATIONS ON THE RELATIONS OF EMOTIONS AND ALLERGY.....	66
Leon J. Saul	
REVIEWS, ABSTRACTS, NOTES AND CORRESPONDENCE.....	72
SEX HORMONES AND PSYCHIC CONFLICT—A CASE REPORT.....	72
Edward S. Tauber and George E. Daniels	
A NOTE ON THE INEFFECTUALNESS OF SEX-HORMONE MEDICATION IN A CASE OF PRONOUNCED HOMO- SEXUALITY.....	87
Saul Rosenzweig and R. G. Hoskins	
REVIEWS OF PERIODICAL LITERATURE.....	90
BOOK REVIEW.....	101

VOLUME III, NO. 2, APRIL, 1941

BIOLOGY OF DRIVES.....	105
Curt P. Richter	
THE FRONTAL LOBES AND CONSCIOUSNESS OF THE SELF.....	111
Walter Freeman and James W. Watts	
MYASTHENIA GRAVIS AND PSYCHOSIS. REPORT OF A CASE WITH OBSERVATIONS ON ITS PSYCHOSOMATIC IMPLICATIONS.....	120
Max Hayman	
THE USE OF PSYCHOLOGICAL TESTS IN THE EVALUATION OF INTELLECTUAL FUNC- TION FOLLOWING HEAD INJURY: REPORT OF A CASE OF POST-TRAUMATIC PER- SONALITY DISORDER.....	138
Arthur L. Benton and Ira L. Howell	
CORTICAL ENERGY PRODUCTION IN THE PSYCHOSES.....	152
Frederick Lemere	
THE INCIDENCE OF NEUROSIS IN CASES OF BRONCHIAL ASTHMA.....	157
Viva Schatia	
REVIEWS, ABSTRACTS, NOTES AND CORRESPONDENCE.....	170
VASO-DILATATION IN NORMAL AND SCHIZOPHRENIC SUBJECTS DURING CYCLOPROPANE ANESTHESIA.....	170
H. Freeman	
KYMOGRAPH RECORDS OF NEUROMUSCULAR (RESPIRATORY) PATTERNS IN RELATION TO BEHAVIOR DIS- ORDERS.....	174
Trigant Burrow	
THE EFFECT OF THE EMOTIONS UPON DIAPHRAGMATIC FUNCTION.....	187
William B. Faulkner	
A CLINICAL NOTE ON A MECHANISM OF PSYCHOGENIC BACK PAIN.....	190
Leon J. Saul	
REVIEWS OF PERIODICAL LITERATURE.....	192
BOOK REVIEWS.....	196

VOLUME III, NO. 3, JULY, 1941

A PSYCHOSOMATIC STUDY OF THE SEX CYCLE IN WOMEN.....	199
M. Altmann, E. Knowles, and H. D. Bull	
GOAL, MECHANISM AND INTEGRATIVE FIELD.....	226
Thomas M. French	
AUTONOMIC SYMPTOMS IN PSYCHONEUROTICS.....	253
Irving Bieber and Sidney Tarachow	
A PHYSIOLOGICAL APPROACH TO THE CONCEPT OF ANXIETY.....	263
Lawrence S. Kubie	
REVIEWS, ABSTRACTS, NOTES AND CORRESPONDENCE.....	277
CHRONIC FATIGUE.....	277
Wendell Muncie	
A HISTORICAL REVIEW OF PSYCHIATRIC TREATMENT.....	286
Oskar Diethelm	
PSYCHONEUROSES IN WAR TIME.....	295
Edwin G. Zabriskie and A. Louise Brush	
CLINICAL VERSUS EXPERIMENTAL APPROACH IN PSYCHOSOMATICS.....	330
Franz Alexander	
COMMENT ON DR. ALEXANDER'S DISCUSSION.....	337
John C. Whitehorn	
CONCLUDING REMARKS.....	339
Franz Alexander	
REVIEWS OF PERIODICAL LITERATURE.....	340
BOOK REVIEWS.....	342

VOLUME III, NO. 4, OCTOBER, 1941

THE EMOTIONAL SETTINGS OF SOME ATTACKS OF URTICARIA.....	349
Leon J. Saul and Clarence Bernstein, Jr.	
THE RELATION OF THE RORSCHACH COLOR RESPONSE TO THE USE OF COLOR IN DRAWINGS.....	370
Jurgen Ruesch and Jacob E. Finesinger	
BLOOD PRESSURE AND PULSE CHANGES IN NORMAL INDIVIDUALS UNDER EMO- TIONAL STRESS; THEIR RELATIONSHIP TO EMOTIONAL INSTABILITY.....	389
Don P. Morris	
BRAIN POTENTIALS AND MORPHINE ADDICTION.....	399
H. L. Andrews	
THE INVOLUTIONAL PSYCHOSES: A SOCIO-PSYCHIATRIC STUDY.....	410
William Malamud, S. L. Sands and I. Malamud	
REVIEWS, ABSTRACTS, NOTES AND CORRESPONDENCE.....	427
THE MEASUREMENT OF INDIVIDUAL DIFFERENCES IN AUTONOMIC BALANCE.....	427
M. A. Wenger	
ORIGIN OF A WHEALING RESPONSE TO COLD.....	435
Harold A. Abramson	
PREGNANCY FOLLOWING THE DECISION TO ADOPT.....	441
Douglass W. Orr	
REVIEWS OF PERIODICAL LITERATURE.....	447
BOOK REVIEW.....	448
NOTE.....	449
INDEX.....	451

IS THE HYPOTHALAMUS A CENTER OF EMOTION?

JULES H. MASSERMAN, M.D.*

SINCE EARLIEST times certain students of the human mind, apparently not quite convinced of the reality of their own formulations, have sought to endow their psychological abstractions with a sort of borrowed substantiality by locating functions such as "the will" and "the emotions" in some particular bodily organ. Thus, Aristotle taught that the purposiveness or "entelechy" of the organism dwelled in the heart; Erasistratos (circa 300 B.C.) attributed metapsychological functions to the cerebellum and Herophilus, a contemporary, conceived that will and affect flowed from the region of the third ventricle. Following such precedents, Galen designated the rhombencephalon as "the seat of the soul," Descartes the pineal, and other scholars throughout the ages selected such other anatomical structures as seemed sufficiently important and mysterious.¹ Of course, in these enlightened times, all such idle speculations apparently are past, since, were we to believe certain more recent and enthusiastic writers,² man's drives and emotions really spring from lo, his hypothalamus! It is an odd commentary, then, that after two millenniums

of laborious research, we are to concede that Herophilus was within two millimeters of being right.

Yet to those of us less satisfied with easy or whimsical answers the problem remains highly troublesome. For were we to accept the thesis that man's emotional life originates in—or is even controlled by—this tiny substructure of the diencephalon, then it would also follow that many mental and behavioral aberrations that we had previously considered to be highly complex personality disorders were merely peripheral manifestations of so-called "hypothalamic storms" caused simply by "exhaustion," disease, or "bad nervous inheritance" in this new and all-important "emotional center."³ Psychiatry would then become, in large part, the study and treatment of various disorders of the hypothalamus and many psychosomatic problems hitherto considered crucial would resolve themselves into demonstrable sophistries. But before accepting so simple an organic formulation it may be well to examine more carefully the data on which it is based. It is therefore my purpose in this paper to present a critique of the physiological and clinical evidence as to the rôle of the hypothalamus in emotion, to report for the first time the results of a series of specific experimental investigations of the question, and to formulate a concept of hypothalamic function more in accord with fundamental neurological and psychiatric principles.

* From the Division of Psychiatry, Department of Medicine and the Otho S. A. Sprague Institute, University of Chicago.

¹ Democritus, a more eclectic philosopher, distributed the functions of the soul to the liver (desire), heart (anger), and head (reason). For other intriguing historical notes, *vide* Hollander (73).

² Cf., as an example: "Here in this well-concealed spot . . . lies the very main-spring of primitive existence—vegetative, emotional and reproductive—on which, with more or less success, man has come to superimpose a cortex of inhibitions." Cushing (36).

³ The terms are quoted from Alvarez (4).

ANIMAL EXPERIMENTAL DATA

Goltz, in 1892, was the first experimentalist to observe that a decerebrate dog, even when gently handled, occasionally responded with behavior suggestive of fear, rage and indiscriminate attack. Twelve years later, Woodworth and Sherrington (168) reported that lashing of the tail and growling, biting and running movements could be produced in the decerebrate cat by the stimulation of a sensory nerve. Bechterev (19) apparently the first to stimulate the subcortical centers directly, reported that the "thalamic" responses consisted of vocalizations, respiratory and circulatory changes, erection of hair and coordinated somatic movements. Karplus and Kreidl, in a long series of experiments beginning in 1909, then showed that faradic stimulation of the hypothalamus and subthalamus in anesthetized animals gave rise to the sympathetic and motor reactions usually associated with emotional expression (*e.g.*: change of heart rate, increase in blood pressure, pupillary dilatation, horripilation, etc.) and that these responses were mediated by nerve tracts which originated in the hypothalamus and descended through the cervical cord into the sympathetic system. Confirming the initial observations by Dussier de Barenne (1920), Cannon and Britton then showed (1925) that when the cortex of the cat is disconnected from lower centers and the animal permitted to emerge from the anesthesia, spontaneous outbursts of motor and sympathetic activity resembling fear and rage occur, and that these reactions are accompanied by changes in the activity of the internal organs and in the composition of the blood (24) similar to those that characterize affective behavior in the intact animal (26). Bard (1928) then demonstrated that this so-called "*sham rage*"⁴ could be elic-

ited not only in chronic decorticate cats but also after the removal of all parts of the brain cranial to the lower and caudal portions of the diencephalon: *i.e.*, the hypothalamus. Further, since the responses in cats with sections placed more caudally were no longer "welded together to form the rage reaction," Bard concluded that the "*expression of anger is dependent on central mechanisms*" located in the hypothalamus. Later experiments by Ranson and his associates⁵ and by myself (109) have shown that the direct electrical stimulation of the hypothalamus in unanesthetized cats produced mydriasis, piloerection, snarling, lashing of the tail, and biting, clawing, and fighting movements ending in the flight of the animal at the cessation of the stimulus. Moreover, in a series of recent studies it has been demonstrated in my laboratory (108) that these responses were diminished by the administration of hypnotic drugs such as amytal or nembutal, whereas the instillation of a minute amount of metrazol (112) or picrotoxin (114) directly into the hypothalamus of a recovery animal initiated a crescendo of excitation reaching a seeming frenzy of rage and fear.⁶ These and other investigations demonstrated that the hypothalamus of experimental animals contains nuclei and fiber tracts which

⁴ Italics mine. In a later publication (Bard and Rioch, 15, p. 93) the term "quasi-rage" was proposed as not implying that the reaction is "fake or counterfeit." Nevertheless, stress was again laid on the fact that the "sham rage" of decorticate cats is variable, poorly integrated, and stops abruptly at the end of the stimulus. Similar "release phenomena," such as undirected erotic behavior and sham fear in reaction to hissing noises, also occurred in the decorticate cats. The authors observed fleeting signs of "pleasure" in only one animal in their own series, but Bazett and Penfield (17) and Schaltenbrand and Cobb (150) reported that decorticate cats purred after feeding, and Gibbs and Gibbs (59) described a "purring center" in the infundibular region.

⁵ Ranson (135), Kabat, Magoun and Ranson (84).

⁶ Similar effects are produced by strychnine. [Dussier de Barenne (42), Masserman (109)].

mediate the hormonal changes⁷ and sympathetic and skeletal motor⁸ manifestations commonly seen in affective states—a conclusion of obvious neurophysiological importance. Nevertheless, the evidence thus far quoted did not answer a question more pertinent to our present interest: does stimulation of the hypothalamus also give rise to the actual *experience* of fear, rage, or any other affect as such in the animal?

The experimental approach to this problem was obviously beset with difficulties. To begin with, long experience with cats had demonstrated that the "emotional" reactions of these animals are few and primitive indeed: erotic arousal, purring self-content, anger and fear are all that can be deduced from observation. Again, even these interpretations could at best be only behavioristic; for instance, to show, as Bard (14) has done, that the hypothalamus "may exert an influence on the *capacity to display* sexual excitement" is not to demonstrate that the hypothalamus plays any rôle in the origin or conscious perception of the erotic emotion per se, especially since reflex sexual behavior can be induced in mesencephalic or even spinal cats by vaginal stimulation.⁹ In fact, Cannon and Britton (26) and subsequent workers had recognized this difficulty by employing the terms "sham rage," "pseudoaffective reactions," and "quasi-emotional states" (15) to describe the behavior of the experimental animals. It was apparent, moreover, that the significance of such behavior would have to be tested not only in waking animals with an intact cerebral cortex, but also by a number of criteria ordinarily applicable to true affective states. The criteria selected for

specific investigation were therefore the following:

- 1) Does the direct stimulation of the hypothalamus change the affective reactions of the animal to external situations?
- 2) Does the activity induced by hypothalamic stimulation persist after the stimulus, as is the case with normal affective states?
- 3) Does the induced activity modify or displace behavior occasioned by spontaneous affects?
- 4) Do extensive lesions of the hypothalamus permanently change the emotional reactivity of the animal?
- 5) And finally, can the animal be trained to adapt to direct hypothalamic stimulation, as would be the case if a significant affective experience were thereby induced?

It is my purpose in the next section to present a brief resume of the work done in my laboratory during the past four years on the problems presented by these criteria.

ANIMAL EXPERIMENTAL STUDIES

I. EFFECTS OF HYPOTHALAMIC STIMULATION

When a 60-cycle current of from 2 to 4 volts is applied through an implanted bipolar needle electrode directly to the hypothalamus of an unanesthetized, freely-moving cat, the animal begins to retract its ears, crouch, growl, raise its back and lash its tail, and to show a crescendo of the following typical sympathetic and motor reactions: hyperpnoea, salivation, mydriasis with widened palpebrae, piloerection, biting and striking movements with claws unsheathed and finally, precipitate running as though in blind attempts to escape. Similar but more prolonged and intensive activity may be induced by the intrahypothalamic injection of 0.05

⁷ Cannon and Rapport (27), Houssay and Molinelli (74).

⁸ Ectors, Brookens and Gerard (45), Hinsey (71).

⁹ Sherrington (156, p. 852-853), Dusser de Barenne and Koskoff (44), Fulton (51), Bard (12, 13, 14).

cc. of 10% metrazol or .01 picrotoxin.¹⁰ Nevertheless, much as these reactions resemble those of rage and fear, they differ from the latter in certain significant respects. For instance, the ostensibly aggressive activity during hypothalamic stimulation is not directed toward specific objects in the animal's environment, even when these are manipulated so as directly to irritate the animal. Again, the responses induced by hypothalamic stimulation are not adapted to the surroundings; *e.g.*, the cat will dash itself repeatedly against the sides of the cage and neglect a readily available avenue of escape. Moreover, all the pseudo-affective reactions cease abruptly at the end of the stimulus without leaving any of the residua (mewing, trembling, hiding, etc.) ordinarily observed after true emotional states.¹¹ In effect, the activity induced by hypothalamic stimulation is mechanical, diffuse, stereotyped, stimulus-bound, and seems to carry no greater emotional connotation than would the contraction of a skeletal muscle induced by the stimulation of an efferent nerve.¹² On these phenomenological grounds alone then, pseudo-affective reactions differ significantly from those in true emotional states.

2. EFFECTS OF HYPOTHALAMIC STIMULATION ON SPONTANEOUS BEHAVIOR PATTERNS

Within thirty-six hours after the aseptic implantation of electrodes into

¹⁰ The experimental techniques employed in these studies have been described in detail in previous reports (Masserman, 108, 109, 113). The behavior of the experimental animals during electrical or pharmacologic stimulation of the hypothalamus and after hypothalamic "conditioning" has also been recorded on motion picture films prepared by the author and distributed by the Psychological Cinema Exchange, Lehigh University, Bethlehem, Pennsylvania.

¹¹ The abrupt cessation of pseudo-affective activity when the stimulus is discontinued corresponds to that observed in the "either-or" behavior of decorticate cats (142).

¹² Similar observations were made by Bard (10) with

the hypothalamus, a properly operated cat in most instances will show normal responses to petting, feeding, restraint, threats by dogs, and other emotionally meaningful external situations. If the hypothalamus of the animal is then stimulated electrically while the animal displays such normal reactions, its behavior will continue almost unchanged until mechanically interfered with by the motor components of the pseudo-affective responses. For instance, the animal will often continue to lap milk, purr, clean its fur, or respond to petting during hypothalamic stimulation despite the appearance of mydriasis, salivation, horripilation and other typical manifestations of "sham rage." When these observations are contrasted with the immediate abandonment of feeding, purring, or contrectative activities under the influence of true fear or rage produced, for instance, by the sight of a dog, the conclusion becomes evident that faradic stimulation of the hypothalamus produces either no significant change in emotional attitude, or that the affective modifications are so minor as to exert no significant influence on normal behavior patterns.

3. EFFECTS OF HYPOTHALAMIC LESIONS

Ranson and his associates (76, 78, 137), Bard (14), and I (110), have observed that cats and monkeys with large bilateral electrolytic lesions of the hypothalamus are stuporous, somnolent,¹³ cataleptic, and apparently emotionally apathetic for from several days to several months after operation. These experiments have frequently been quoted in support of the thesis that affective tensions and their mimetic expression both depend on the in-

regard to the "sham rages" of his decorticate preparations, and probably contributed to his choice of the term.

¹³ Serota's (153) and Harrison's (68) discussions of the rôle of the hypothalamus in sleep are significant in this connection.

tegrity of the hypothalamus; however, the significance of the experimental observations in this regard is greatly diminished by the fact that large lesions in the hypothalamus also produce profound changes in the metabolic activity and homeostatic balance of the animal;¹⁴ in fact, these changes are so great that more than 90 per cent of the animals with large bilateral lesions die within three days despite all special care (67). Moreover, in animals which do survive long enough to re-establish their body economy to nearly normal levels, the behavioral responses to food, mice, dogs, or erotic stimulation (14) correspondingly return to nearly normal within from one to three weeks, even though large bilateral lesions had been made in the hypothalamus and secondary degeneration of the proximal neurones in its descending pathways had also occurred (110). Further, when such survival preparations are reanesthetized and electrical stimulation is applied stereotactically to juxta-hypothalamic regions in the subthalamus or mesencephalon, typical "hypothalamic" responses, such as oculomotor effects, horripilation, changes in respiration and blood pressure and running or clawing movements are again obtained (118). To be sure, these responses are not as well coordinated and are more easily exhausted than those in animals with an intact diencephalon, indicating that the hypothalamus probably functions in facilitating, integrating and perhaps even reinforcing the bodily expressions of emotion.¹⁵ Nevertheless,

¹⁴ Bailey and Bremner (7), Sachs and McDonald (148), Watts and Fulton (165), Davison and Selby (40), Barris and Ingram (16), Cleveland and Davis (31), Ingram, Barris and Ranson (76), Fisher, Ingram and Ranson (48), Gildea and Man (60), Ranson (138), Sheehan (155).

¹⁵ This "tonic" function of the hypothalamus on the number and intensity of the electrically induced pseudo-affective responses was demonstrated in experiments in which the electrical reactivity of one side of the hypothalamus was diminished and its

the observations as a whole indicate that, with appropriate stimuli, not only emotional reactions but even their somatic accompaniments can occur despite the presence of extensive destruction of the hypothalamus and the primary neurones of its descending pathways.

4. PHARMACOLOGICAL EVIDENCE

Certain writers have implied that since drugs such as sodium amytal¹⁶ and metrazol¹⁷ act on the hypothalamus and also influence the mood and behavior of both experimental animals and humans, the hypothalamus must in some way control emotion. However, the weakness of this reasoning is apparent from the fact that both the drugs mentioned as examples act widely throughout the nervous system,¹⁸ and that therefore such pharmacological observations have little bearing on the question of localization of specific functions.

5. CONDITIONING EXPERIMENTS

To test the relationship of hypothalamic activity to emotional experience by other and better controlled behavioristic methods, several series of conditioning experiments were planned and carried on at the Sprague Institute of the University of Chicago during the past two years. These experiments were based on the postulate that if the behavior induced by the application of an electric current to the hypothalamus were really accompanied by a meaning-

exhaustibility increased when the opposite hemi-hypothalamus was destroyed (Masserman, 110), whereas the reverse of these effects was produced by the injection of metrazol into the opposite intact hemi-hypothalamus (112).

¹⁶ Leiter and Grinker (99), Keeser and Keeser (93), Sahlgren (149), Stavrakys (160), Masserman (108).

¹⁷ Gellhorn (57), Masserman (112, 114), Carlson, Darrow and Gellhorn (29).

¹⁸ Fulton, Siddell and Rioch (53), Buding (23), Eichler and Hildebrandt (46), Maloney and Tatum (105), Council on Pharmacy and Chemistry (32), Hicks (70), Koll (96), Rice and Isenberger (140), Masserman (108, 109, 112, 114).

ful subjective experience, the animal could be trained to respond in some manner to a sensory signal that heralded the application of the hypothalamic stimulus. If, however, direct stimulation of the hypothalamus produced only a syndrome of peripheral reactions unaccompanied by any subjective experience, then the animal could not be

"conditioned" in this manner, since the conditional signal would, like the hypothalamic stimulus itself, acquire no meaning for the animal.

Technique: To make these experiments possible and to increase the accuracy of the procedure, the author devised and built an apparatus (Fig. 1) by means of which a waking, freely

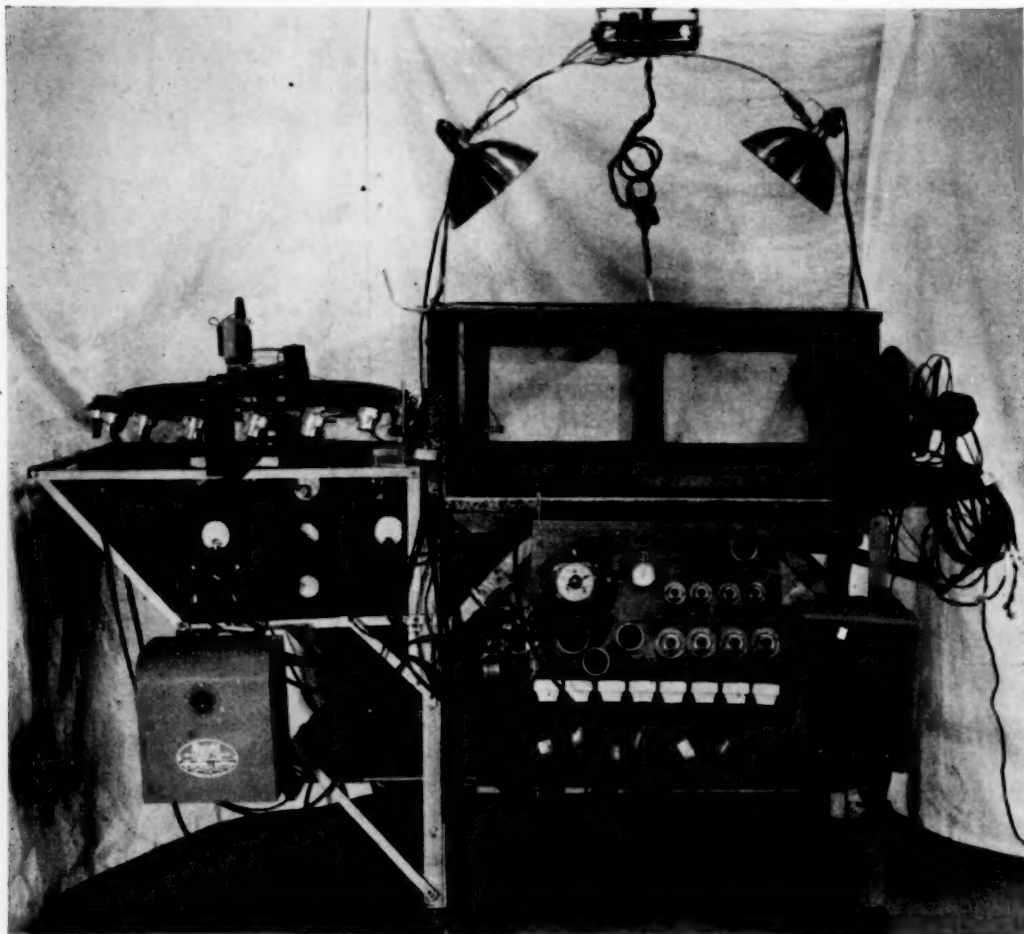


FIG. 1. The Automatic Conditioning Apparatus. The apparatus consists of a glass cage equipped with an electric grid floor, an escape table and stimulus wires sprung through the roof in a manner to provide for their easy extension and rotation. At the left is a solenoid-controlled wheel which delivers pellets of food to a hinged box in the cage, and beneath the wheel are three electrical stimulus sources for connection through the extension wires to electrodes implanted into the hypothalamus and cerebral cortex of the prepared experimental animals. On the panel below the cage are mounted manual controls for a) various light, sound and air-blast signals; b) high voltage condenser shocks to the floor grids; c) the feeder wheel and d) stimulus currents to the cortex and hypothalamus. All of these stimuli may also be administered and registered automatically by employing the multiple-contact timing device beneath the cage. An experimental animal may thus be subjected to any desired combination of peripheral stimuli in any of the sensory modalities, after which its hypothalamus or cerebral cortex may be electrically stimulated in experiments designed to investigate central nervous functions and conditioned responses.

moving animal could be subjected to selected stimuli (the flash of various lights, sounds of different pitch and intensities, stimulation of the skin by an air blast or by a controlled, high-frequency current, the presentation of food, etc.) preparatory to the direct faradic stimulation of the hypothalamus through implanted needle electrodes. The apparatus was also equipped with an automatic governor that made it possible to apply these stimuli alone or in combination for selected periods and at any desired intervals. Various series of experiments were then carried out as follows:

Preliminary observations: In order to determine whether "automatic" conditioning responses could be established without conscious awareness on the part of the animal (Settlage, 1951), cats lightly anesthetized with ether¹⁹ were prepared for kymographic recording of the respiration, pulse rate and blood pressure, and were then subjected to a combination of intense light, sound and air-blast stimuli for three seconds before the application directly to the hypothalamus of a constant electrical stimulus. The latter produced the usual responses: pupillary dilatation, erection of the hair, chewing and running movements, and biphasic changes in respiration and in blood pressure. These effects remained remarkably constant if the stimuli were given no oftener than at 90-second intervals and the animal remained in good condition. However, although the experiment was repeated in eight animals, in four of which the combination of stimuli was administered 140 or more times over a period of 5 hours, in not a single instance did any combination of sensory stimuli elicit a definite sympathetic or motor response in the absence of direct hypothalamic

stimulation; *i.e.*, there was no evidence that peripheral "pseudoaffective" reactions could be mechanically "engrammed" by any number of such attempts at direct central conditioning. In these experiments, then, the hypothalamus was shown to behave not as an afferent, experience-mediating organ but as a way-station on efferent sympathetic and motor pathways which, as shown in the corresponding work of Gantt and his associates²⁰ on the cortex, cerebellum and spinal motor roots, cannot be conditioned by direct stimulation.

ELECTROENCEPHALOGRAPHIC STUDIES

There remained, of course, the possibility that neural "engrams" had really been left in the hypothalamus by the conditioning procedures just outlined, but that the nerve impulses mediated by such engrams had not become sufficiently "channeled" during the experiment to produce grossly observable peripheral effects when the sensory stimuli (light, sound, etc.) were administered alone.²¹ A more sensitive method of studying nerve functions in the absence of peripheral effects—namely, electro-encephalography—was therefore employed.^{21a} In these experiments action potentials from an electrode implanted into the hypothalamus of a recovery preparation were recorded on an oscillograph tracing, first, while the animal was subjected to light, sound or tactile (air-blast) stimuli, and again immediately after a faradic stimulus was applied directly to the hypothalamus through the same electrode. This tech-

²⁰ Loucks (101, 102), Gantt (54), Brogden (22), Gantt and Loucks (55).

²¹ These terms are taken from older concepts of the "neural mechanisms" of conditioning phenomena; the neurophysiological fallacies inherent in such concepts are well discussed by Ashby (6).

^{21a} These experiments were done in the electro-encephalographic laboratory of Dr. Theodore J. Case, to whom thanks are due for helpful collaboration.

¹⁹ This anesthetic was chosen because when lightly administered it does not materially diminish the electrical reactivity of the hypothalamus.

nique offered the following possibilities: a) that a characteristic wave form could be obtained from the hypothalamus when the animal was in a resting state; b) that this wave form would change in a constant fashion during the administration of the sensory stimuli and again after faradic stimulation of the hypothalamus; and finally, c) that if conditioning occurred, the changes in the oscillographic record characteristic of hypothalamic stimulation would begin to appear at the application of the conditional stimuli. However, the results of such experiments in 18 animals were these:

1) Tracings obtained from various regions of the hypothalamus with the cats in the waking state, even when the animal was sufficiently quiet to eliminate muscle action currents, were so irregular that characteristic hypothalamic patterns could not be discerned. Occasional bursts of from 3 to 8 slow undulations (2 to 4 per second) occurred in seven of the tracings, four of which were from the region of the tuber, but the amplitude and intervals between the waves were inconstant. In 8 anesthetized animals these bursts appeared with greater frequency and in larger amplitude (60 to 150 microvolts) in leads from the tuber or nucleus ventromedialis, but again there was no constancy or regularity in their occurrence. In four cats in which simultaneous tracings were made from these regions and the contralateral posterior sigmoid gyrus, the two potentials occasionally appeared in opposite phase, but otherwise seemed completely unrelated.

2) In neither the anesthetized nor the waking cats did light, sound, or painful stimuli produce any constant or typical changes in the hypothalamogram. Rapid (30-50 per second) irregular waves were noted in three animals when their fur was ruffled by a current of air; however, these waves did not spread to the

sigmoid cortex and ceased abruptly with the stimulus. Moreover, this observation did not warrant further investigation in the present experiments, inasmuch as direct electrical stimulation of the hypothalamus, even when sufficiently strong to produce the peripheral reactions characteristic of sham rage, apparently left no typical after-effects in the hypothalamic tracing. Finally, animals which received up to 140 conditional sensory stimuli (including the air blast) followed by electrical stimulation of the hypothalamus showed no indications of acquiring any definite hypothalamic action-current patterns. It appeared, then, that whereas the modified electroencephalographic technique here described presented interesting possibilities for research in collateral reflex pathways, especially those of pilosensitivity, it did not adequately record the hypothalamic reactions, if any, to other sensory stimuli, and therefore could contribute less as an experimental method to the study of central condition than would direct observation of the behavior of the animal.

CONTROL EXPERIMENTS IN PERIPHERAL CONDITIONING

These began with an attempt to determine whether cats could actually learn to react to a combination of signals that heralded an emotionally meaningful external stimulus. The initial procedure was therefore as follows: the cat was subjected to sound, light and air-current stimuli, singly or in combination for from 3 to 6 seconds, after which the grid floor of the conditioning apparatus was charged with a high-voltage, low-amperage condenser current. The conditioned behavior desired was that the animal escape from the grid either by mounting a small platform in the cage or by hanging from a bar near the roof. Unfortunately, four of the animals, after very little experi-

ence, learned to perch on these supports directly after being put into the cage and remained there despite all attempts to shock them off during the intervals when the grid floor itself was electrically neutral. Three other animals, even after successful escapes from the grid, abandoned further attempts at adaptation to the experimental conditions and either flew into a blind rage at the preliminary signals or else squatted with paws folded under and endured the grid shocks in a seemingly frustrated but resigned manner. Significantly, however, after several days all seven animals showed reactions suggestive of neurotic behavior, *i.e.*, they would not respond to feeding or petting in or out of the cage, showed episodic restlessness and anxious vocalizations, and became resistive and sometimes vicious in behavior toward the experimenter and to other animals.²² Nevertheless, nine other animals readily learned to avoid the grid shock by mounting either support at the light or sound signal, and thus confirmed Culler's observation that the cat is capable of being conditioned to escape from an electrical shock *when the latter is perceived as a noxious stimulus*. With these observations as a control, the next step was to test the possibility that direct conditioning of the hypothalamus also produced an unpleasant affect and could therefore be similarly conditioned.

DIRECT HYPOTHALAMIC CONDITIONING

Technique: An animal with implanted hypothalamic electrodes was placed in the cage of the automatic apparatus and subjected to the light, sound and

air-blast signals for from 3 to 8 seconds, after which a typical "sham rage" reaction was produced by direct electrical stimulation of the hypothalamus. This procedure was repeated at intervals of from 2 to 8 minutes, 20 to 40 combinations of stimuli being administered daily for from three to twelve days. As may be anticipated, these experiments were done in the hope of eliciting some evidence of behavioral response to the preliminary sensory signals and thereby demonstrating that direct hypothalamic stimulation produced not only the external manifestations of anger, but also a true affective experience which would be anticipated at the sensory signal and for which the animal could learn to prepare, compensate, or adapt. The results, however, were as follows:

1) Eighteen animals which were exposed to from 60 to 480 such constellations of stimuli over a period of from two to twelve days continued to show no manifest reactions whatever to the light, sound, or air-blast signals singly or in combination, although the direct faradization of the hypothalamus which followed each combination of sensory stimuli invariably produced the usual dramatic manifestations of "sham rage." Obviously, two postulates could account for these negative results: a) that the animal had really experienced an emotional disturbance during each stimulation of the hypothalamus, but had promptly "forgotten" each such experience despite as many as 480 repetitions, or b) the much more likely explanation that the preliminary signals had simply acquired no meaning for the animal because the direct hypothalamic stimuli with which they were associated had themselves produced no significant affective state.

2) In six other animals the experiments were not quite as conclusive, in that slight pupillary dilation and a transient startle or crouching response

²² More recent experiments in our laboratory have shown that cats conditioned to open a food box on a sound or light signal can be made to display behavior typical of an experimental "neurosis" (crouching and trembling at the food signal, protracted refusal of food, continuous aggressiveness and resistance to handling, etc.) if the established feeding responses are disrupted on a few occasions by an unexpected and alarming (but otherwise harmless) blast of air across the food box.

occurred at the sensory stimuli after from 80 to 160 conditioning constellations. However, even these reactions were inconstant, and never approached the preparations for fight or flight normally exhibited by cats aware of a dangerous external stimulus; significantly also, no behavior suggestive of "neurotic" after-effects were observed in any of the animals subjected to direct hypothalamic conditioning. It appeared, then, that in these animals the preliminary sensory signals had heralded not the coming of an intense affective state, but only the onset of a dimly perceived and remembered discomfort for which little bodily preparation or adaptation was necessary. The negative results of the attempts at "central conditioning," therefore, are in conformity with the evidence previously cited that direct stimulation of the hypothalamus induces dramatic emotional-mimetic reactions, but that these are not accompanied by the experimental or conative components of true fear or rage.

DISCUSSION

It is manifestly impossible in this section to review the vast literature on the anatomy and physiology of the hypothalamus, on electroencephalography and on the phenomena of conditioning which furnished the rationale for the further investigations reported in this paper: nevertheless, an attempt will be made to summarize some of the more significant preceding work under the following headings: a) extra-hypothalamic neural mechanisms of emotional expression, b) electroencephalographic studies on cortico-hypothalamic relationships, c) previous experiments in central conditioning, and d) clinico-pathological evidence.²³

²³ Excellent reviews of the various fields of experimentation relevant to this study will be found in the Volumes XIX and XX of the Association for Research in Nervous and Mental Disease Series, in Dunbar (42), and in recent monographs by Ingram (75), Ran-

EXTRA-HYPOTHALAMIC SYMPATHETIC CONTROL

Recent emphasis on the rôle of the hypothalamus in emotional mimetic functions has obscured the fact that these functions are also mediated by direct sympathetic pathways both above and below the diencephalon.²⁴ Thus, Kennard, after a critical review of the experimental evidence up to 1937, concluded that the cerebral cortex exerts control over the heart, respiration, blood vessels, pupils, gastrointestinal tract, urinary bladder and body temperature, and may thus directly govern the external manifestations of emotional reactions quite independently of the hypothalamus.²⁵ Crouch and Thompson (33) confirmed these findings, and added the observation that in dogs sialorrhoea "of a sympathetic type" could also be obtained by stimulation of the anterior sigmoid gyrus. That such visceromotor pathways do not necessarily relay in the hypothalamus is indicated by the work of Friedberg (50) who showed that pupillary and vasomotor responses could be obtained by stimulation of the pyramidal tract in the internal capsule as long as the tract remained intact. Similarly, Karplus and Kreidl obtained marked sympathetic responses by stimulation of the frontal lobes (86) and of the corpus

son and Magoun (139), Gantt (54), Lashley (98), Alpers (3), and Rioch (143).

²⁴ Cf. Carlson, Gellhorn and Darrow (29). Different regions of the cortex may also either facilitate or inhibit sympathetic reflexes mediated elsewhere in the nervous system (Morison and Rioch, 128). The pseudo-affective reactions obtained in unanesthetized animals by faradic stimulation of the hypothalamus are increased in some animals by simultaneous stimulation of the posterior sigmoid cortex (Masserman, Beal, and Sanders 115).

²⁵ The relevant data as to the patterns of cortical function have been reviewed by Ashby (6), Denny-Brown (41), Mettler (110), Rioch and Rosenblueth (144), and Pinkston and Rioch (132). In this connection also, Bard (13) wrote: "The more closely one examines the operations of the brain the more unsound appears the practices of distinguishing sharply between cortical and subcortical functions."

Luysi (85). At levels below the hypothalamus, Keller (94) observed that "A typical sham rage response can be obtained in a preparation with only the cord, medulla, pons and small caudolateral portions of the mid-brain remaining intact." It is interesting that the "sham rage" reactions in Keller's animals, like those in our own with hypothalamic lesions, were not as well organized as in decorticate preparations (Bard, 13) again indicating the importance of the hypothalamus as an integrating center for the efferent impulses; nevertheless, such observations demonstrate that the control of emotional manifestations is not invested solely in the hypothalamus but that, on the contrary, it is distributed sufficiently widely in the central nervous system to make the recovery of adequate visceral control possible despite the presence of extensive hypothalamic lesions (110). If this is true in experimental animals, the comparative cephalization of function in the human²⁶ makes it highly probable that direct cortical control of the bodily processes involved in emotion is even more highly developed in

man.²⁷ In this connection it is particularly significant that direct electrical stimulation of the human hypothalamus in eight patients during intracranial operations under local anesthesia produced only moderate changes in the heart rate and blood pressure accompanied by no psychic or sensory effects other than drowsiness in four of the cases (White, 166).

ACTION CURRENTS OF THE HYPOTHALAMUS

Gerard, Marshall, and Saul (58), using the Horsley-Clarke stereotactic instrument and a concentric needle electrode connected to a cathode ray oscillograph, explored the brain of the cat systematically for action currents and reported that among the highly variable wave forms obtainable from the hypothalamus only the supra-optic portion emitted "regular musical howls often stopped by light." It is significant, moreover, that these investigators noted "considerable interaction between separate elements of one sensory system, or even between those of separate systems (optic and auditory)" and thus emphasized the difficulties inherent in interpreting action currents in the neuraxis with reference to specific stimuli, nerve tracts or remote points of origin (*v.i.*).

More directly germane to our present interest is the work of Grinker and Serota (65). These investigators screwed electrodes into the hard palate, cranium and nasal bones of the cat, and observed in the oscillographic tracings taken from the "hypothalamic" (palatal-nasal) lead that there occurred 4-5 per second waves of 30-50 microvolts upon which were superimposed others of 13 per second and 12-15 microvolts. The slow waves were increased 25 to 50 per cent in voltage and accelerated to 5-7 per second when recorded 7-8 seconds after an induction shock was passed through the palatal-nasal electrodes.

²⁶ Cf. Jackson (81), Darwin (38), Karplus and Kreidl (86), Spiegel (159), Tower (161), and Papez (120).

²⁷ Bard (13) in considering the question as to whether "in primates the process of corticalization has not been accompanied by a shift of the essential management of every kind of emotional expression [from] the brain stem" comes to the acceptable conclusion that cortical and lower mechanisms always "cooperate" in directing behavior. Rioch (142) states more positively: "... it may be predicted that cortical representation of autonomic function will find explanation in terms of a corticalization of the efferent mechanisms of emotional expression concomitant with a corticalization of the mechanisms for the control and for the setting into action of the more subtle forms of emotional expression." Fulton (51) adds: "These considerations make it evident that the cerebral cortex governs not only the somatic system but all systems involved in emotional expression, psychological tensions, fears and phobias, etc.; ... it is probable that the relative simplicity of the hypothalamus in man and anthropoid as compared with lower vertebrates reflects the increasing dominance of the cortex in respect of autonomic regulation."

Such stimulation also caused the appearance of spikes, cusps and beta waves in the "cortical" (cranial-nasal) tracing—an effect which disappeared after destruction of the hypothalamus and which was therefore interpreted as evidence for the hypothalamic "control" of cortical activity. The experiments were then continued with human subjects, in whom "hypothalamic" and "cortical" leads were arranged as follows: 1) a curved insulated electrode was inserted through the nostril and imbedded in the sphenoid bone; this electrode, when coupled with clips on both ears, constituted the "hypothalamic" lead, and 2) a "cortical" lead was arranged to span the differences in electrical potential between the ear clips on the one hand, and a silver-wire coil fastened to the scalp on the other. The passage of a strong faradic current (up to 1 cm. coil separation on the Harvard inductorium) for from 5 to 20 seconds between the nasal and ear electrodes caused pharyngeal pain accompanied by pupillary dilatation, perspiration, rise in blood pressure, and occasionally persistent hyperthermia (up to 103°F. for "several days")—effects attributed by the authors to hypothalamic stimulation. Strong electrical stimuli by this route also evoked muscular spasms—this time attributed to a spread of the current to the peduncles or mesencephalon. As to the psychological effects, Grinker and Serota reported that "apart from transient pain responses, sometimes anxiety appeared during stimulation and it persisted with crying and expressions of fear often for some minutes. In one subject protracted sobbing occurred. Several patients saw their lives pass before their eyes, as has been described in drowning. *In general, the affective state accompanying hypothalamic stimulation could not be correlated with the rage attacks in human encephalitis, the manic responses from*

operative manipulation of the hypothalamus, or the sham rage of cats."²⁸

In tracings taken from the "hypothalamic" (*i.e.* pharyngo-aural) leads in their patients, Grinker and Serota observed "typical" 4 per second waves not materially affected by opening the eyes, but the total patterns varied greatly from individual to individual. Faradic stimulation of the pharynx "was followed by increased excitation in the hypothalamic electrogram" which sometimes became "synchronous with that of the cerebral cortex." Such stimulation also caused 3-4 per second undulations and "giant waves" (100-120 microvolts) to appear in the "cortical" (cranio-aural) lead for as long as 8 minutes—a phenomenon again taken to indicate a direct and persistent influence on the cortex by the hypothalamus. In a direct attempt to arouse "strong emotions" in one patient he was told that masturbation had "irreparably damaged him . . . [after which the] . . . cortical and hypothalamic curves became irregular and partly synchronous, and giant waves and plateaus with frequent cusps appeared." Since these effects paralleled those produced by an electrical stimulus to the pharynx (although, in the latter instance, the changes in the "cortical" curve were sometimes inexplicably delayed for 6 minutes), Grinker concludes that the electroencephalographic findings following both electrical and "emotional" actuation of the hypothalamus "indicate a driving of cortex by hypothalamus parallel to the well recognized overwhelming of intellectual processes by emotional activity."²⁹

²⁸ Italics mine.

²⁹ In a later paper (Grinker and McLean, 66) this concept is developed as follows: "Perhaps we can break this impasse [in a depressed patient] between the emotional drives registered subjectively and the cortical inhibitory state and its strict super-ego manifestations, by externally forcing out the aggressive behavior in an artificially induced motor fit by metra-

Grinker and Serota's experiments represent a bold and original departure in the electroencephalographic study of cortico-hypothalamic relationships and therefore merit extended consideration. It must be pointed out, however, that because of the technical difficulties implicit in their methods, their results are difficult to evaluate. Thus, since it is improbable that the pharyngeal electrodes really came nearer than 2 cm. to the hypothalamus in the cat³⁰ or from 3 to 6 cm. in the human³¹ and were in the latter case actually much closer to electrically dominant centers in the pons and medulla, it is difficult to conceive how minute differences in potential between these electrodes and others placed on the ears or nose could be said to be "hypothalamic" in origin. For the same reasons, electrical currents passed between such electrodes and of sufficient intensity to cause pain must necessarily, if they reached the brain directly at all, have stimulated not only most of the cranial nerves, but also have directly affected the important and closely-spaced motor and vegetative centers in the mid-brain and rhombencephalon and thus produced profound motor and sympathetic effects quite independent of hypothalamic sources.³² The concurrent changes in the electrical activity of the hypothalamus and cortex in Grinker and Serota's experiments may therefore have indicated not a spread of "excitation" from hypothalamus to

cortex³³ but a spread of activity simultaneously to both regions from the various masses of nerve tissue actuated by the painful and widespread electrical stimulus.³⁴ Finally, even more important is the consideration that the electroencephalographic tracing from any region can indicate only whether the electrical discharges from the cells in that region are simultaneous, rhythmic and in phase—in which case the summated potentials can be recorded as "waves" of a definite form—or whether the individual cells are beating aphasically, in which case the tracing is highly variable in form and amplitude. In either eventuality, the wave forms themselves cannot yet be shown to furnish a valid index of total nerve tissue function on the purely psychological levels of conation or affect, let alone specific ideational content. On the contrary, in the case of the cortex it is well known that intellectual activity tends to abolish the resting alpha rhythm³⁵ whereas in our experimental animals the only constant effects produced in the direct hypothalamogram during a sensory stimulus (air-blast) was to render the recorded wave forms highly irregular. To summarize, there-

³³ However, that activity of the hypothalamus itself (as induced by an accurately localized, stereotactically placed bipolar stimulus) does influence the cortex was indicated in a series of experiments in our laboratory in which it was shown that such a stimulus increased the chewing and licking response obtained by direct stimulation of the left posterior sigmoid gyrus in the waking cat. Interestingly, the converse was also true in most animals: cortical stimulation intensified the sympathetic responses obtained by simultaneous actuation of the hypothalamus (Masserman, 115). Bard (13) likewise concludes that: "Doubtless the cortex has an excitatory as well as inhibitory influence on the hypothalamic mechanism."

³⁴ Similarly, a fall in the temperature of the hypothalamus during sleep (Serota, 153) or a rise in hypothalamic temperature during emotional excitement (Serota and Gerard, 154) indicates that the activity of the hypothalamus may be depressed or heightened during the respective states, but furnishes no proof that the hypothalamus either initiates or controls these variations in consciousness.

³⁵ Adrian and Mathews (1), Jasper (82).

zol. We cover the hypothalamus with kerosene and set a spark to it—thus causing a detonation within the resisting cortex, repeat this several times and a normal pathway from diencephalon to cortex is grooved and the forces need no longer spread downward to the viscera in an abnormal [*sic*] direction [There is thus] a change in the dynamics between cortex (ego) and diencephalon (biologic drives)."

³⁰ Winkler and Potter (167), Clarke and Henderson (30), Rioch, Wislocki and O'Leary (145).

³¹ Piersol, G. "Human Anatomy," p. 1156.

³² Keller (94), Ingram, Ranson and Hannett (80), Magoun (104).

fore: a) differences in electrical potential between the palate and nasal bones of the cat or between the pharynx and ears of the human cannot be said to be hypothalamic in origin in either instance; b) the passage of a strong electrical current across the base of the skull produces widespread stimulation of afferent nerves and important sympathetic and motor centers remote from the hypothalamus; and c) variations in potential, even when accurately localized in the cortex or hypothalamus are not an accurate index of the respective "intellectual" or "emotional" functions of these regions.

These considerations are given added weight by the work of Hoagland, Cameron, Rubin and Tegelberg (72) who repeated Grinker and Serota's experiments in one normal and five schizophrenic subjects and reported a) that the alpha rhythm in both the "H" ("hypothalamic"—i.e., pharyngeal) and "cortical" leads was abolished by opening the eyes (indicating similarity of origin in the visual system); b) that "undetected facial movement may produce disturbing artefacts in the pharyngeal lead," rendering it "less reliable as an index of emotional response than is the relatively stable occipital lead"; and c) *that it was highly uncertain whether the "H-lead" recorded hypothalamic action currents at all.*³⁶ It must be concluded, therefore, that such ostensibly sensitive and objective methods as the attempted study of the psychological functions of specific regions of the brain through externally placed electroencephalographic and stimulating electrodes do not really provide valid data as to the psychosomatic inter-relationships of the cortex and hypothalamus, and that therefore any quasi-phrenological translation of "hypothalamic action potentials" into "emotions" which are then reflected in the "corti-

³⁶ Italics mine.

cal" tracings as modified "intellectual processes" is entirely unjustified.

CONDITIONING EXPERIMENTS

One fundamental principle has recently emerged from various lines of investigation of animal behavior; namely, that an animal will respond to a given constellation of stimuli only when the configurational field with which it is presented possesses not only some apperceptible "meaning," but also furnishes an adequate incentive for action.³⁷ If that meaning is apprehended and the incentive is unequivocal, the animal's behavior will be integrated and efficient: i.e., relatively well adapted and stable "conditioned" responses appear. If, however, the meanings and incentives are minimized³⁸ or distorted, conflictful behavior that is inefficient, poorly adaptive or "neurotic" is induced (Liddel, 100), as illustrated in the cats which could not learn to escape from the electric grid. In any case, this principle makes possible a relatively objective approach to the study of animal motivation, either by the method of presentation of obstacles to achievement of the goal (Warden, 164), by the indirect conditioning techniques described by Pavlov (130), or by attempts at direct conditioning of structures in the central nervous systems through implanted electrodes such as employed during recent years by Gantt, Loucks, Culler, Shurrager, myself and others.

Particularly significant both with regard to the importance of incentives and the rôle of the cortex in conditioning has been the work of Loucks (102). In 1935 this investigator reported a series of experiments in which he at-

³⁷ Warden (164), Loucks (102), Lashley (98b), Finch (47), Brogden (22).

³⁸ Thus, when a dog's appetite is satiated its conditioned salivary responses are markedly diminished (Gantt, quoted by Loucks, 102; Finch, 47).

tempted to condition limb movements in waking dogs by stimulating the motor cortex through an implanted induction coil (101) immediately after the sound of a buzzer, with or without the employment of a subsequent food reward. Dog no. 1 was given 600 trials with the buzzer-cortical shock combination over a period of two months, at the end of which time no responses had as yet developed to the auditory stimulus, although the induction shock to the cortex that followed each buzzer signal still produced the stereotyped hind leg movement. Similarly, in dog no. 2, only three questionable "conditioned" leg responses to the buzzer were noted in 600 trials, and in dog no. 3, only two such responses appeared in 500 trials. As an added incentive, dog no. 4 was then fed after each buzzer-cortical shock configuration, with the result that a comparatively stable conditioned response to the buzzer was readily established; moreover, when the feeding was discontinued, the conditioned behavior was quickly extinguished and could not be re-established in 400 trials. Dog no. 5, submitted to the same routine, also showed typical conditioning of the cortically-induced leg movement when fed after each trial, but extinction of the response when the feeding was discontinued. These experiments demonstrated that direct stimulation of the cerebral cortex does not in itself produce a "meaningful" experience or an adequate incentive (in Loucks' terminology—an "urge") and therefore cannot lead to significant spontaneous adaptations in behavior.³⁹

³⁹ Loucks concluded: "Various experiments in which conditioning has taken place when only limited portions of the formal, reflex pathways were functioning were reviewed to show that conditioning is established upon the bases of certain primitive urges, impulses, appetites—probably subcortical in character—and that it is the feeling of pain, hunger, nausea, etc. which is the significant factor rather than the reflex response which is merely one component in a complex pattern."

but that when the experiences are made significant to the animal by employing an external incentive (or an equivalent stimulus to nociceptive neurones in a posterior root or in the spinal cord), conditioned responses can readily be established and are then characteristically compensatory and adaptive.⁴⁰ Further, Marquis (106), and Culler and Mettler (34) have shown that this principle applies to subcortical centers whether or not the functions of the cerebral cortex are intact. If, then, neither direct nor adaptive responses could be elicited in our experimental animals after prolonged and intensive attempts to condition the hypothalamus, it must be concluded that artificially induced activity in this structure does not in itself produce an experiential conative or affective state of an intensity sufficient to influence significantly the behavior of the animal.

THE RÔLE OF "CONSCIOUSNESS"

One other aspect of recent work in conditioning is of theoretical importance from the standpoint of a dynamic psychology of unconscious motivations: namely, that conditioned adaptation may take place in the absence of acute conscious awareness of the training procedure on the part of the animal, provided that the stimuli retain some contingency to the animal's needs. Thus, Koudrin (97), Rothmann (146), and Marquis (107), reported that after the removal of the visual cortex, dogs either retained previously established visual conditioned reflexes, or that these could be readily reconstituted by further adaptive training. Similarly, Poltyrew and Zeliony (134), and Culler and Mettler (34) produced conditioned responses in totally decorticate dogs, indicating that subcortical perceptor-effector mechanisms may be primary in

⁴⁰ Yacorzynski and Guthrie (169), Loucks and Gantt (103).

certain types of reactive behavior to external necessities and that in these processes the cortex may play only a "facilitatory" rôle (107) in finer discrimination and adaptation. With regard to even lower centers, Shurrager and Culler (158) have recently shown that "phenomena which meet the criteria of motor conditioning and extinction are shown to occur in the spinal dog. When mechanical or electric stimulation of the tail is combined with shock to the left hind-paw, the flexor muscle, M. semi-tendinosus, which at first contracts only to paw-shock, comes to respond when the tail alone is stimulated. . . . Evidence from severing spinal roots indicates that the central conditioned state is located at the level of the spinal cord at which the conditioned muscle response is innervated. . . ." From a consideration of the literature in relation to their work, Shurrager and Culler then conclude: "Conditioning and extinction are not restricted to cortical and thalamic levels, but are general properties of central nervous tissue."⁴¹ Further, that conditional adaptation can take place in the unconscious state and even without concurrent motor expression is also indicated by the experiments of Settlage (151) who demonstrated that when a cat is narcotized with amytal and subjected to a succession of bell signals, each of which heralds a faradic shock to the hind leg, conditioned movements of the leg appeared at the bell signal *after the animal recovered from the narcosis, even though such responses had not been observed previously.* From the evidence thus far considered, then, there emerges no *a priori* reason against the possibility that the hypothalamus, were it an important perceptor-effector cen-

ter, could be conditioned in either a recovery or anesthetized animal. The failure to produce such conditioning in our experiments, therefore, indicates all the more clearly that the functions of the hypothalamus are concerned simply with the coordination of efferent impulses, and not with the mediation of adaptation-producing affective experience, whether this be postulated to be conscious or unconscious in nature. Finally, it is of interest in this connection to quote from a review by Lashley (98a) who, after a similar analysis of the evidence relative to the affective functions of the thalamus (in which he includes all of the diencephalon) concludes:

"The supposed evidence that the thalamus adds the affective or emotional character to sensations breaks down completely when subjected to critical analysis. The affective changes resulting from thalamic lesion are restricted to a small group of somasthetic sensations and cannot be interpreted as a general change of affectivity. The changes correlate definitely with the special properties of conduction, summation, and irradiation of this group of sensory processes and not at all with a specific locus in the thalamus. The pathological changes following thalamic lesions are primarily in the character of the sensations, in intensity, duration, localization, and are, therefore, not relevant to the problem of affect. There is no evidence whatever that the thalamus contributes facilitative impulses which might form a basis for the motivational aspects of emotion. Thus, the only part of the thalamic theory of emotion which has factual support is the localization of motor centers for emotional expression within the hypothalamus. It seems certain that these motor centers do not contribute directly to other aspects of emotion and there is no evidence for the existence

⁴¹ In this connection it is significant to note that Bykov and Alexejew-Berkmann (25) claim success in establishing conditioned responses even of the kidneys and spleen in dogs.

of other affective or emotional centers."⁴²

CLINICAL CONSIDERATIONS

It is not within the scope of this paper to review exhaustively the various clinical observations which have been cited in support of the thesis that the hypothalamus plays a direct rôle in human emotion; in any case, the space devoted to the presentation of new animal experimental evidence and to a re-consideration of the relevant literature makes such a review impossible here. Nevertheless, in conformity with the introductory section, it may be well to point out that many of the clinical observations, often uncritically quoted, have been made by workers who did not sufficiently distinguish the external manifestations of "emotional" expression from a true inner affective experience; in this sense, reports such as those of Foerster and Gagel (49) who observed "manic" responses when the floor of the third ventricle was manipulated at operation, are of no greater heuristic significance than the manifestations of sham rage under corresponding conditions in an experimental animal. In this connection, Dott (42a) specifically noted that the symptomatic

⁴² The conclusions reached by Rioch (142) are just as unequivocal: "There is still an unfortunate tendency to talk and write loosely about a 'hypothalamic emotional center.' It seems highly likely that parts of the diencephalon, including parts of the hypothalamus, play an important rôle in the expression of certain emotions. There is no evidence from animal experimentation, however, that the affective and sensory components of emotion are present in these reactions in decorticate cats. In fact, such circumstantial evidence as exists (the anatomical degenerations, the stereotyped nature of the response, the type of interaction of other stimuli, etc.) suggests the absence of affect in these preparations. Moreover, the rapid rate of subsidence of the reactions in decorticate cats is totally different to the course of events in normal emotional behavior. It is, therefore, quite as unjustifiable to say that emotion is localized in the hypothalamus as to say that the pseudo-affective rage reaction is localized in Deiter's vestibular nucleus merely because the antigravity reflexes play a rôle in the mechanism of the expression of the latter."

laughter he observed in a patient with a tumor of the mammillary bodies seemed "meaningless." The report of Grinker and Serota (65) that purported stimulation of the hypothalamus through a pharyngeal electrode produced not only profound sympathetic and emotional mimetic effects but also true fear and anxiety has already been critically considered, and stands in direct contrast to White's (166) observation that direct, visually controlled electrical stimulation of the hypothalamus produces no such responses. Alpers (3), in a recent review of the clinical data, seems to imply in one place (p. 744) that both lesions and irritation of the hypothalamus may produce emotional experience, yet in conclusion he specifically states: "It would seem from the assemblage of facts . . . that the hypothalamus is now urged as the seat of the emotions, intellect and personality. No such conclusions are possible. The hypothalamus may be regarded as an area concerned with the *expression* of emotional reactions which are ordinarily sifted and weighed by the cerebral cortex. . . . If one were inclined to drift into *fancy*, one might even assert that expressions of rage and temper, and coarseness of behavior are hypothalamic in origin. The facts, however, do not warrant such an assumption, true though such an assertion may be."⁴³

CLINICO-PATHOLOGICAL DATA

Morgan (123) has reported that "the substantia grisea and the nuclei tuberis laterales were consistently involved in 96 cases of epilepsy,⁴⁴ psychoses and

⁴³ In his formal (1940) discussion of Alper's paper, Rioch again comments: "Certainly, on the basis of the experimental work, we cannot accept the concept of the hypothalamus as an 'emotion center.'"

⁴⁴ Yakovlev (170) also argues for the hypothalamic etiology of epilepsy, but unfortunately mainly on the basis of *a priori* physiologic reasoning. Cf. Penfield's (131) discussion of "autonomic epilepsy."

mental deficiency"; however, he notes that he was "unable to eliminate the possibility that the changes in the hypothalamus were secondary in nature, being an end result of the mental disorder (*sic*) rather than a primary causative factor." The specific interpretation of the microscopic appearance of hypothalamic structures is rendered even more questionable by the peculiar histologic characteristics and variable staining properties of the neurones in this region (62) and also by the fact that histopathological changes have been reported in fever (121) and as secondary to many of the chronic and terminal diseases to which psychotic patients are subject (163). On the other hand, Schuster (150a) has noted gross changes in emotional behavior in patients with central lesions remote from the hypothalamus; *e.g.*, the pons, cerebral peduncles, thalamus and base of the frontal lobe. In this field as in others, therefore, it must be concluded that the evidence for a primary hypothalamic etiology for the emotional disturbances in the psychoses is again highly inconclusive.

CONCLUSIONS

As a result of certain misinterpretations of experimental and clinical data a tendency has recently arisen to stress unduly the rôle of the hypothalamus in the conative and emotional aspects of behavior. Examination of the evidence, however, reveals the following:

1. Experiments on animals have indicated that the hypothalamus may integrate and possibly reinforce the effector neural impulses controlling some of the sympathetic and motor manifestations of fear and rage; however, there is little or no basis for the thesis that the hypothalamus governs or even mediates the emotional experiences themselves.

2. Further work in this laboratory has furnished evidence that a direct somato-psychic relationship between hypothalamic function and affective experience probably does not exist, inasmuch as a) the reactions induced by stimulation of the hypothalamus do not, within limits, greatly modify spontaneous emotional behavior, b) animals with extensive hypothalamic lesions react to emotional stresses and can apparently experience genuine affective states, c) animals subjected to prolonged conditioning procedures in which sensory signals precede direct hypothalamic stimuli do not learn to respond to either the sensory or hypothalamic stimuli in ways analogous to their spontaneous or experimental adaptations to situations of adequate emotional significance.

3. The clinical and pathological data as to the rôle of the human hypothalamus in emotional experience are not conclusive.

4. It would, therefore, seem safest in the present state of our knowledge to assign to the hypothalamus its experimentally demonstrable rôle in reinforcing and coordinating the neural and hormonal mechanisms of emotional *expression*, and reserve for more adequate proof the hypothesis that it is either the dynamic source or the seat of experience of affective states. On the other hand, much experimental, psychological and clinical evidence clearly indicates that an emotion is a highly integrated conative, cognitive and affective-somatic reaction in which not only the central nervous system, but the entire organism functions as a psychobiologic whole in its sensitive adaptations to the continually changing organismal milieu.⁴⁵

⁴⁵ Thanks are due to E. W. Haertig, Donald Buchanan, John Beal and Rosaltha Sanders who assisted in various phases of these studies.

BIBLIOGRAPHY

1. ADRIAN, E. D. and MATHEWS, B. H. C.: The Berger Rhythm Potential Change from the Occipital Lobes in Man. *Brain*, 57: 355, 1934.
2. ALPERS, BERNARD J.: Relation of the Hypothalamus to Disorders of Personality. *Arch. Neurol. Psychiat.*, 38: 291, 1937.
3. ALPERS, BERNARD J.: Personality and Emotional Disorders Associated with Hypothalamic Lesions. *A. Research Nerv. & Ment. Dis., Proc.*, 20: 725, 1940; also *Psychosom. med.*, 2: 286, 1940.
4. ALVAREZ, W. C.: New Light on the Mechanisms by which Nervousness Causes Discomfort. *J. Amer. Med. Ass.*, 115: 1010, 1940.
5. ASCHNER, B.: *Wien. klin. Wschr.*, 25: 1042, 1912.
6. ASHBY, W. R.: The "Path" Theory of Cortical Function. *J. Neurol. Psychopath.*, 12: 148, 1931.
7. BAILEY, P. and BREMER, F.: Experimental Diabetes Insipidus. *Arch. intern. Med.*, 28: 773, 1921.
8. BARD, PHILLIP: A Diencephalic Mechanism for the Expression of Rage with Specific Reference to the Sympathetic Nervous System. *Amer. J. Physiol.*, 84: 490, 1928.
9. BARD, PHILLIP: Studies on the Cerebral Cortex. *Arch. Neurol. Psychiat.*, 30: 40, 1932.
10. BARD, PHILLIP: On Emotional Expression after Decortication with Some Remarks on Certain Theoretical Views. *Psychol. Rev.*, 41: 309, 424, 1934.
11. BARD, PHILLIP: Emotion: I. The Neuro-humoral Basis of Emotional Reactions In. Murchison, A *Handbook of General Experimental Psychology*. Clark University Press, Worcester, 1934.
12. BARD, PHILLIP: Oestral Behavior in Surviving Decorticate Cats. *Amer. J. Physiol.*, 116: 4, 1936.
13. BARD, PHILLIP: Emotional Behavior Patterns in Animals. *A. Research Nerv. & Ment. Dis., Proc.*, 100: 218, 1939.
14. BARD, PHILLIP: The Hypothalamus and Sexual Behavior. *A. Research Nerv. & Ment. Dis., Proc.*, 20: 551, 1940.
15. BARD, PHILLIP and RIOCH, DAVID McK.: A Study of Four Cats Deprived of Neocortex and Additional Portions of the Forebrain. *Johns Hopk. Hosp. Bull.*, 60: 73, 1937.
16. BARRIS, R. W. and INGRAM, W. R.: The Effect of Experimental Hypothalamic Lesions upon Blood Sugar. *Amer. J. Physiol.*, 114: 555, 1936.
17. BAZETT, H. C. and PENFIELD, W. G.: A Study of the Sherrington Decerebrate Animals in the Chronic as well as the Acute Condition. *Brain*, 45: 185, 1922.
18. BEATTIE, J.: Hypothalamic Mechanisms. *Canad. med. Ass. J.*, 26: 400, 1932.
19. BECHTEREV, W.: Die Bedeutung der Schügel auf Grund von Experimentellen und Pathologischen Daten. *Virchows Arch.*, 110: 322, 1887; also, *La Psychologie Objective*, Paris, Alcan, p. 111, 1913 (quoted by Lashley 1938).
20. BORDO, R. C. and BENAGLIA, A. E.: Hyperglycaemia Produced by Sympathin in Emotional Excitement. *Amer. J. Physiol.*, 121: 738, 1938.
21. BRICKNER, R. M.: Certain Characteristics of the Cortical Influence over the Sympathetic Nervous System. *J. nerv. ment. Dis.*, 71: 698, 1930.
22. BROGDEN, W. V.: The Unconditioned Stimulus Substitution in the Conditioning Process. *Amer. J. Physiol.*, 123: 24, 1938.
23. BUDING, E. S.: Pharmacologic Classification of Metrazol on the Basis of its Action on the Central Nervous System. *Arch. exp. Path. Pharmacol.*, 157: 143, 1930.
24. BULATAO, E. and CANNON, W. B.: Conditions of Activity in Endocrine Glands, Rôle of Adrenal Medulla in Pseudodffective Hyperglycemia. *Amer. J. Physiol.*, 72: 295, 1925.
25. BYKOV, K. M. and ALEXEJEV-BERKMANN, I. A.: Die Ausbildung bedingter Reflexe auf die Harausscheidung. *Pflüg. Arch. ges. Physiol.*, 224: 710, 1930; Die Ausbildung bedingter Reflexe und die Harausscheidung; bedingte Reflexe bei denervierter Niere, *ibid.*, 227: 301, 1931.
26. CANNON, W. B.: The James-Lange Theory of Emotions. *Amer. J. Psychol.*, 30: 106, 1927; Again the James-Lange and the Thalmic Theories of Emotion. *Psychol. Rev.*, 38: 281, 1931; The Wisdom of the Body. Norton & Co., New York, 1939.
27. CANNON and RAPPORT: Studies on Conditions of Activity in Endocrine Glands; Denervated Heart in Relation to Adrenal Secretion. *Amer. J. Physiol.*, 58: 308, 1921; *ibid.*, Reflex Center for Adrenal Secretion and its Responses to Excitatory and Inhibitory Influences. 58: 338, 1921. Cannon, W. B. and Britton, S. W.: Studies on the Conditions of Activity in Endocrine Glands. *Amer. J. Physiol.*, 72: 283, 1925.
28. CARLSON, HELEN B., DARROW, C. W. and GELLHORN, E.: Physiologic and Pharmacologic Studies on the Hypothalamus. *Amer. J. Physiol.*, 129: 329, 1940.
29. CARLSON, H. B., GELLHORN, E., and DARROW, C. W.: Representation of the Sympathetic and Parasympathetic Nervous Systems in the Forebrain of the Cat. *Arch. Neurol. Psychiat.*, 45: 105, 1941.
30. CLARKE, R. H. and HENDERSON, E. E.: Investigations of the Central Nervous System: Methods and Instruments. Johns Hopkins Press, Baltimore, 1920.
31. CLEVELAND, D. and DAVIS L.: Further Studies of the Effect of Hypothalamic Lesions upon Carbohydrate Metabolism. *Brain*, 40: 459, 1936.
32. COUNCIL ON PHARMACY AND CHEMISTRY: Sodium Amytal. *J. Amer. med. Ass.*, 97: 1886, 1931; 101: 208, 1933.
33. CROUCH, RICHARD L. and THOMPSON, J. KENNETH: Autonomic Functions of the Cerebral Cortex. *J. nerv. ment. Dis.*, 89: 328, 1939.
34. CULLER, E. and METTLER, F. A.: Conditioned Behavior in a Decorticate Dog. *J. comp. Psychol.*, 18: 291, 1934.
35. CUSHING, H.: Posterior Pituitary Hormone and the Parasympathetic Nervous System. *Proc. nat. Acad. Sci., Wash.*, 17: 163, 1931.
36. CUSHING, H.: Papers Relating to the Pituitary Body, Hypothalamus and Para-Sympathetic Nervous System. Charles C Thomas, Springfield, 1932.

37. DARROW, CHESTER W. and GELLHORN, E.: Antagonism of Adrenalin and Autonomic Effects of Metrazol. *Amer. J. Physiol.*, 126: 474, 1939.
38. DARWIN, C.: The Expression of the Emotions in Man and Animals. Appleton, New York, 1897.
39. DAVIS, H. and DAVIS, P.: The Electrical Activity of the Brain: its Relation to Physiological States and to States of Impaired Consciousness. *A. Research Nerv. & Ment. Dis., Proc.*, 10: 50, 1938.
40. DAVISON, C. and SELBY, N. E.: Hypothermia in Cases of Hypothalamic Lesions. *Arch. Neurol. Psychiat.*, 33: 570, 1935.
41. DENNY-BROWN, D.: Theoretical Deductions from the Physiology of the Cerebral Cortex. *J. Neurol. Psychopath.*, 13: 52, 1932.
42. DUNBAR, HELEN F.: Emotions and Bodily Changes. Columbia University Press, New York, 1938.
- 42a. DOTT, N. M.: Surgical Aspects of the Hypothalamus. In Clark *et al.*, The Hypothalamus. Oliver and Boyd, Edinburgh, 1938. Pp. 131-185.
43. DUSSEY DE BARENNE, J. G.: Recherches expérimentales sur les fonctions du système nerveux central, faites en particulier sur deux chats dont le néopalium avait été enlevé. *Arch. néerl. Physiol.*, 4: 31, 1920.
44. DUSSEY DE BARENNE, J. G. and KOSKOFF, V. D.: Flexor Rigidity of the Hind Legs and Priapism in the "Secondary" Spinal Preparation of the Male Cat. *Amer. J. Physiol.*, 102: 75, 1932.
45. ECTORS, LEON, BROOKENS, NORRIS L., and GERARD, R. W.: Autonomic and Motor Localization in the Hypothalamus. *Arch. Neurol. Psychiat.*, 39: 789, 1938.
46. EICHLER, O. and HILDEBRANDT, F.: The Action of Cardiozol on the Circulation. *Arch. exp. Path. Pharmacol.*, 116: 100, 1926.
47. FINCH, GLEN: Hunger as a Determinant of Conditional and Unconditional Salivary Response Magnitude. *Amer. J. Physiol.*, 123: 2, 1938.
48. FISHER, C., INGRAM, W. R. and RANSON, S. W.: Diabetes Insipidus and the Neurohumoral Control of Water Balance. Edwards Bros., Ann Arbor, 1938.
49. FOERSTER, O. and GAGEL, O.: Ein Fall von Ependymyste des III Ventrikels. *Z. ges. Neurol. Psychiat.*, 140: 313, 1934.
50. FRIEDBERG, C. K.: Zur Frage der Identität der Corticalen Somatischen und Vegetativen Zentren nach Reizversuch an der Degenerierten Inneren Kapsel. *Z. ges. Neurol. Psychiat.*, 134: 50, 1931.
51. FULTON, J. F.: Levels of Autonomic Functions with Particular Reference to the Cerebral Cortex. *A. Research Nerv. & Ment. Dis., Proc.*, 10: 219, 1938.
52. FULTON, J. F. and INGRAHAM, F. D.: Emotional Disturbances Following Experimental Lesions of the Base of the Brain. *J. Physiol.*, 67: 28, 1929.
53. FULTON, J. F., SIDDELL, E. G. T. and RIOCH, O., McK.: "Dial" as a Surgical Anesthetic for Neurological Operations. *J. Pharmacol.*, 40: 423, 1930.
54. GANTT, W. HORSLEY: Contributions to the Physiology of the Conditioned Reflex. *Arch. Neurol. Psychiat.*, 37: 848, 1937.
55. GANTT, W. HORSLEY and LOUCKS, R. B.: Posterior Nerve Function as Tested by the Conditioned Reflex Method. *Amer. J. Physiol.*, 123: 74, 1938.
56. GELLHORN, ERNST: Effects of Hypoglycemia and Anoxia on the Central Nervous System. *Arch. Neurol. Psychiat.*, 40: 125, 1938.
57. GELLHORN, ERNST: Physiologic and Pharmacologic Investigations on the Nature of Hypothalamic Excitation. *Amer. J. Psychiat.*, 97: 944, 1941.
58. GERARD, R. W., MARSHALL, W. H. and SAUL, L. J.: Electrical Activity of the Cat's Brain. *Arch. Neurol. Psychiat.*, 36: 675, 1936.
59. GIBBS, E. L. and GIBBS, F. A.: A Purring Center in the Cat's Brain. *J. comp. Neurol.*, 64: 209, 1936.
60. GILDEA, E. F. and MAN, E. B.: The Hypothalamus and Fat Metabolism. *A. Research Nerv. & Ment. Dis., Proc.*, 20: 501, 1940.
61. GOLTZ, F.: Der Hund ohne Grosshirn. *Pflüg Arch. ges. Physiol.*, 51: 570, 1892.
62. GRINKER, R.: Neurology. Charles C Thomas, Springfield, 1934. p. 279.
63. GRINKER, R.: A Method for Studying and Influencing Cortico-Hypothalamic Relations. *Science*, 87: 73, 1938.
64. GRINKER, R.: Hypothalamic Functions in Psychosomatic Interrelations. *Psychosom. Med.*, 1: 19, 1939.
65. GRINKER, R. and SEROTA, HERMAN: Studies on Cortico-hypothalamic Relations in the Cat and Man. *J. Neurophysiol.*, 1: 573, 1938.
66. GRINKER, R. and McLEAN, H.: The Course of a Depression Treated by Psychotherapy and Metrazol. *Psychosom. Med.*, 2: 119, 1940.
67. HAERTIG, E. W. and MASSERMAN, J. H.: Hypothalamic Lesions and Pneumonia in Cats. *J. Neurophysiol.*, 3: 393, 1940.
68. HARRISON, F.: The Hypothalamus and Sleep. *A. Research Nerv. & Ment. Dis., Proc.*, 30: 635, 1940.
69. HESS, W. R.: Hypothalamus und die zentren des autonomen Nervensystems. *Arch. Psychiat. Nervenkr.*, 104: 548, 1936.
70. HICKS, C. S.: Comparison of Action of Metrazol and Coramine on the Respiratory Center of Man. *Aust. J. exp. Biol. med. Sci.*, 13: 261, 1935.
71. HINSEY, J. C.: The Hypothalamus and Somatic Responses. *A. Research Nerv. & Ment. Dis., Proc.*, 20: 657, 1940.
72. HOAGLAND, HUDSON, CAMERON, D. EWEN, RUBIN MORTON A. and TEGELBERG, JULIUS J.: Emotion in Man as Tested by the Delta Index of the Electroencephalogram: II. Simultaneous Records from Cortex and from a Region near the Hypothalamus. *J. gen. Psychol.*, 19: 247, 1938.
73. HOLLANDER, BERNARD: In Search of the Soul. Dutton & Co. New York, 1924.
74. HOUSSAY, B. A. and MOLINELLI, E. A.: Centre Adrenolino-secreteur Hypothalamique. *C. R. Soc. Biol.*, 93: 1454, 1925.
75. INGRAM, W. R.: The Hypothalamus: A Review of the Experimental Data. *Psychosom. Med.*, 1: 48, 1939.
76. INGRAM, W. R., BARRIS, R. W. and RANSON, S. W.: Catalepsy: An Experimental Study. *Arch. Neurol. Psychiat.*, 35: 1175, 1936.
77. INGRAM, W. R., FISHER, C. and BARRIS, R. W.: Effects of Lesions in the Hypothalamus in Cats. *Amer. J. Physiol.*, 109: 1, 57, 1934.

78. INGRAM, W. R. and RANSON, S. W.: Bulbocapnine: Effect on Animals with Lesions of the Central Nervous System. *Arch. Neurol. Psychiat.*, 31: 987, 1934.
79. INGRAM, W. R., RANSON, S. W. and HANNETT, F. I.: The Direct Stimulation of the Red Nucleus in Cats. *J. Neurol. Psychopath.* 12: 219, 1932.
80. INGRAM, W. R., RANSON, S. W., HANNETT, F. I., TERWILLIGER, E. H. and ZEISS, F. R.: Results of Stimulation of the Tegmentum with the Horsley-Clarke Stereotaxic Apparatus. *Arch. Neurol. Psychiat.*, 28: 513, 1932.
81. JACKSON, J. HUGHLINGS: On Epilepsies and on the After Effects of Epileptic Discharges, *West Riding Reports*, 6: 260, 1876, p. 270 (Quoted by Fulton 51).
82. JASPER, H. H.: Electrical Signs of Cortical Activity. *Psychol. Bull.* 34: 411, 1937.
83. KABAT, H., ANSON, B. J., MAGOUN, H. W. and RANSON, S. W.: Stimulation of the Hypothalamus with Special Reference to the Effect on Gastro-Intestinal Motility. *Amer. J. Physiol.*, 112: 214, 1935.
84. KABAT, H., MAGOUN, H. W. and RANSON, S. W.: Electrical Stimulation of Points in the Forebrain and Midbrain. *Arch. Neurol. Psychiat.*, 34: 931, 1935.
85. KARPLUS, J. P. and KREIDL, A.: Gehirn und Sympathicus. I. Zwischenhirnbasis und Halssympathicus. *Pflüg. Arch. ges. Physiol.*, 129: 138, 1909.
86. KARPLUS, J. P.: Gehirn und Sympathicus. II. Ein Sympathicuszentrum im Zwischenhirn. *Ibid.*, 135: 401, 1910.
87. KARPLUS, J. P.: Gehirn und Sympathicus. III. Sympathicusleitung im Gehirn und Halsmark. *Ibid.*, 143: 109, 1912.
88. KARPLUS, J. P.: Über Totalexstirpationen einer und beider Grosshirnhemisphären an Affen (*Macacus rhesus*). *Arch. Anat. Physiol.*, 155: 1914 (Physiol. Abt.).
89. KARPLUS, J. P.: Gehirn und Sympathicus. IV. Pflüg. *Arch. ges. Physiol.*, 171: 192, 1918.
90. KARPLUS, J. P.: Gehirn und Sympathicus. V. Latenzbestimmungen unter Anwendung einer neuen Methode. *Ibid.*, 203: 533, 1924.
91. KARPLUS, J. P.: Gehirn und Sympathicus. VII. Über Beziehungen der Hypothalamussentren zu Blutdruck und innerer Sekretion. *Ibid.*, 215: 667, 1927.
92. KARPLUS, J. P.: Gehirn und Sympathicus. VIII. *Ibid.*, 219: 613, 1928.
93. KEESER, E. and KEESER, L.: Ueber die Verteilung der Diethylbarbitursäure im Gehirn. *Arch. exp. Path. Pharmacol.*, 179: 226, 1935.
94. KELLER, A. D.: Autonomic Discharges Elicited by Physiological Stimuli in Mid-Brain Preparations. *Amer. J. Physiol.*, 100: 576, 1932.
95. KENNARD, MARGARET A.: The Cortical Influence on the Autonomic System. *Handb. Der Neurologie*, 2: 476, 1937.
96. KOLL, W.: Antagonistic Action of Narcotics and Analeptics on the Central Nervous System. *Arch. exp. Path. Pharmacol.*, 184: 365, 1937.
97. KOURDIN, A. N.: Conditioned Reflexes in the Dog after Extirpation of the Posterior Half of the Hemispheres. Thesis. Leningrad, 1911. (Cited by Pavlov, 130).
98. LASHLEY, K. S.: (a) The Thalamus and Emotion, *Psychol. Review*, 45: 42, 1938; (b) Experimental Analysis of Instinct Behavior, *Ibid.*, 445.
99. LEITER, L. and GRINKER, R. R.: Rôle of the Hypothalamus in the Regulation of Blood Pressure. *Arch. Neurol. Psychiat.*, 31: 54, 1934.
100. LIDDELL, H. S.: The Experimental Neurosis and the Problem of Mental Disorder. *Amer. J. Psychiat.*, 94: 1035, 1938.
101. LOUCKS, R. B.: A Technique for Faradic Stimulation of Tissues beneath the Integument in the Absence of Conductors Penetrating the Skin. *J. comp. Psychol.*, 18: 305, 1934.
102. LOUCKS, R. B.: The Experimental Delimitation of Neural Structures Essential for Learning: The Attempt to Condition Striped Muscle Responses with Faradization of the Sigmoid Gyri. *J. Psychol.*, 1: 5, 1935.
103. LOUCKS, R. B. and GANTT, W. HORSLEY: The Conditioning of Striped Muscle Responses Based upon Faradic Stimulation of Dorsal Roots and Dorsal Columns of the Spinal Cord. *J. comp. Psychol.*, 25: 415, 1938.
104. MAGOUN, H. W.: Descending Connections from the Hypothalamus. *A. Research Nerv. & Ment. Dis., Proc.*, 20: 270, 1940.
105. MALONEY, A. H. and TATUM, A. L.: Cardiozol (Metrazol) and Coramine as Cardio-respiratory Stimulants. *Arch. int. Pharmacodyn.*, 42: 200, 1932.
106. MARQUIS, D. S.: Effects of Removal of Visual Cortex in Mammals with Observations on Retention of Light Discrimination in Dogs. *J. comp. Psychol.*, 18: 303, 1934.
107. MARQUIS, D. S. and HELGARD, E. R.: Conditioned Lid Responses to Light in Dogs after Removal of the Visual Cortex. *J. comp. Psychol.*, 22: 157, 1936.
108. MASSERMAN, J. H.: The Effects of Sodium Amytal and Other Drugs on the Reactivity of the Hypothalamus of the Cat. *Arch. Neurol. Psychiat.*, 37: 617, 1937.
109. MASSERMAN, J. H.: The Effect of Strychnine Sulphate on the Emotional Mimetic Functions of the Hypothalamus of the Cat. *J. Pharmacol.*, 64: 335, 1938.
110. MASSERMAN, J. H.: Destruction of the Hypothalamus in Cats. *Arch. Neurol. Psychiat.*, 39: 1250, 1938.
111. MASSERMAN, J. H.: Effects of Morphine Sulphate on Hypothalamus of the Cat, *Proc. Soc. exp. Biol., N. Y.* 42: 315, 1939.
112. MASSERMAN, J. H.: Action of Metrazol (pentamethylenetetrazol) on the Hypothalamus of the Cat. *Arch. Neurol. Psychiat.*, 41: 504, 1939.
113. MASSERMAN, J. H.: An Automatic Apparatus for the Central Conditioning of Small Animals. *J. comp. Psychol.*, 28: 201, 1939.
114. MASSERMAN, J. H.: Effects of Analeptic Drugs on the Hypothalamus of the Cat, *A. Research Nerv. & Ment. Dis., Proc.*, 20: 624, 1940.
115. MASSERMAN, J. H., BEAL, J. and SANDERS, ROSALTA: Effects of Dilute Ethyl Alcohol on Cortico-Hypothalamic Functions, *J. Pharm. & Exper. Ther.* 40: 450, 1940.
116. MASSERMAN, J. H. and HAERTIG, E. W.: The

- Influence of Hypothalamic Stimulation on Intestinal Activity. *J. Neurophysiol.*, 1: 350, 1938.
117. MASSERMAN, J. H. and JACOBSON, L.: The Effect of Ethyl Alcohol on the Cerebral Cortex and Hypothalamus of the Cat. *Arch. Neurol. Psychiat.*, 43: 334, 1940.
 118. MASSERMAN, J. H.: The Rôle of the Hypothalamus in Emotional Expression, Conditioning, and Experimental Neurosis. Motion Picture Film, 16 mm. black and white, subtitled. Four parts, each about 450 feet. The Psychological Cinema Exchange, Adelbert Ford, Editor. Lehigh University, Bethlehem, Pennsylvania.
 119. METTLER, F. A.: Cerebral Function and Cortical Localization, *J. gen. Psychol.*, 13: 367, 1935.
 120. METTLER, F. A., METTLER, CECILIA C. and CULLER, ELMER: Effect of Total Removal of the Cerebral Cortex. *Arch. Neurol. Psychiat.*, 34: 1238, 1935.
 121. MORGAN, L. O.: Cell-Changes in Some of the Hypothalamic Nuclei in Experimental Fever. *J. Neurophysiol.*, 1: 281, 1938.
 122. MORGAN, L. O.: Alterations in the Hypothalamus in Mental Deficiency. *Psychosom. Med.*, 1: 496, 1938.
 123. MORGAN, L. O.: Cell Changes in Hypothalamus in the Major Psychoses. *A. Research Nerv. & Ment. Dis., Proc.*, 20: 753, 1940.
 124. MORGAN, L. O. and GREGORY, H. S.: Pathological Changes in the Region of the Tuber Cinereum in Idiopathic Epilepsy. *Amer. J. Psychiat.*, 9: 805, 1930.
 125. MORGAN, L. O. and GREGORY, H. S.: Pathological Changes in the Tuber Cinereum in a Group of Psychoses. *J. nerv. ment. Dis.*, 82: 286, 1935.
 126. MORGAN, L. O., VONDERAHE, A. R. and MALONE, E. F.: Pathological Changes in the Hypothalamus in Diabetes Mellitus. *J. nerv. ment. Dis.*, 85: 125, 1937.
 127. MORGAN, L. O. and VONDERAHE, A. R.: The Hypothalamic Nuclei in Heat Stroke. *Arch. Neurol. Psychiat.*, 42: 83, 1939.
 128. MORISON, R. S. and RIOCH, D. McK.: The Influence of the Forebrain on an Autonomic Reflex. *Amer. J. Physiol.*, 120: 257, 1937.
 129. PAPEZ, JAMES, W.: A Proposed Mechanism of Emotion. *Arch. Neurol. Psychiat.*, 38: 725, 1937.
 130. PAVLOV, I. P.: Conditioned Reflexes. Trans. by G. v. Anrep. London, Oxford U. Press, 1927.
 131. PENFIELD, W. G.: Diencephalic Autonomic Epilepsy. *Arch. Neurol. Psychiat.*, 22: 358, 1929.
 132. PINKSTON, J. O. and RIOCH, D. McK.: The Influence of the Cerebral Cortex on Peripheral Circulation. *Amer. J. Physiol.*, 121: 49, 1938.
 133. PIERSOL, G.: Human Anatomy. 3rd Ed. Lippincott and Co., New York. 1156 et seq.
 134. POLTYREW, S. and ZELIONY, G.: Grosshirnrinde und Assoziationsfunktion. *Z. Biol.*, 90: 157, 1930.
 135. RANSON, S. W.: Autonomic Reactions Induced by Electrical Stimulation of the Hypothalamus. *Amer. J. Physiol.*, 109: 85, 1934.
 136. RANSON, S. W.: The Hypothalamus: Its Significance for Visceral Innervation and Emotional Expression. Trans. Coll. Phys. Philad., 4th Series, 32: 222, 1934.
 137. RANSON, S. W.: Somnolence caused by Hypothalamic Lesions in the Monkey. *Arch. Neurol. Psychiat.*, 41: 1, 1939.
 138. RANSON, S. W.: Regulation of Body Temperature. *A. Research Nerv. & Ment. Dis., Proc.*, 20: 342, 1940.
 139. RANSON, S. W. and MAGOUN, H. W.: The Hypothalamus. *Ergebn. Physiol.*, 41: 57, 1939.
 140. RICE, J. C. and ISENBERGER, R. M.: Pharmacodynamic Reactions of Intracisternal Sodium Amytal, Coramine, Metrazol and Picrotoxin. *J. Pharm. & Exper. Ther.*, 59: 43, 1937.
 141. RICHTER, C. P.: Increased Spontaneous Activity Produced in Monkeys by Brain Lesions. *Brain*, 61: 1, 1938.
 142. RIOCH, DAVID McK.: Certain Aspects of the Behavior of Decorticate Animals. *Psychiatry*, 1: 339, 1938.
 143. RIOCH, DAVID McK.: Neurophysiology of the Corpus Striatum and Globus Pallidus, *Psychiatry*, 3: 119, 1940.
 144. RIOCH, DAVID McK. and ROSENBLUTH: Inhibition from the Cerebral Cortex. *Amer. J. Physiol.*, 113: 663, 1935.
 145. RIOCH, DAVID McK., WISLOCKI, G. B. and O'LEARY, J. L.: A Precise of Preoptic, Hypothalamic and Hypophyseal Terminology, with Atlas. *A. Research Nerv. & Ment. Dis., Proc.*, 20: 3, 1940.
 146. ROTHMANN, H.: Zusammenfassender Bericht über den Rothmannschen grosshirnlosen Hund nach klinischer und anatomischer Untersuchung. *Z. ges. Neurol. Psychiat.*, 87: 247, 1923.
 147. RUBIN, M. A. and WALL, C.: Brain Potential Changes in Man Induced by Metrazol. *J. Neurol. Psychiat.*, 2: 107, 1939.
 148. SACHS, E. and MacDONALD, M. E.: Blood Sugar Studies in Experimental Pituitary and Hypothalamic Lesions with a Review of the Literature. *Arch. Neurol. Psychiat.*, 13: 335, 1925.
 149. SAHLGREN, E.: Experimentelle Untersuchungen über den Angriffspunkt des Luminals im Gehirn bei Kaninchen, *Acta psychiat.* Kbn., 9: 129, 1934.
 150. SCHALTENBRAND, G. and COBB, S.: Clinical and Anatomical Studies on Two Cats without Neocortex. *Brain*, 53: 449, 1931.
 - 150(a). SCHUSTER, P.: Psychische Störungen bei Hirntumoren, Enke, Stuttgart, 1903.
 151. SETTLAGE, P.: The Effect of Sodium Amytal on the Formation and Elicitation of Conditioned Reflexes. *J. comp. Psychol.*, 22: 339, 1936.
 152. SETTLAGE, P. and HARLOW, H. F.: Concerning the Sensory Pathway in the Conditioned Reflex. *J. comp. Psychol.*, 22: 277, 1936.
 153. SEROTA, H. M.: Temperature Changes in the Cortex and Hypothalamus during Sleep. *J. Neurophysiol.*, 2: 42, 1939.
 154. SEROTA, H. M. and GERARD, R. W.: Localized Thermal Changes in the Cat's Brain. *J. Neurophysiol.*, 1: 115, 1938.
 155. SHEEHAN, D.: The Hypothalamus and Gastro-Intestinal Regulation. *A. Research Nerv. & Ment. Dis., Proc.*, 20: 589, 1940.
 156. SHERRINGTON, C. S.: The Spinal Cord. In: Schaffer, Textbook of Physiology, 2: 782, 1900.
 157. SHERRINGTON, C. S.: Notes on temperature after Spinal Transection. *J. Physiol.*, 58: 405, 1924.

158. SHURRAGER, P. S. and CULLER, E. A.: Conditioning in Spinal Dog. *J. exp. Psychol.*, 26: 133, 1940.
159. SPIEGEL, E. A.: *Die Zentren des Autonomen Nervensystem*. Springer, Berlin, 1928.
160. STRAVRAKY, G. W.: Response of Cerebral Blood Vessels to Electric Stimulation of the Thalamus and Hypothalamic Regions. *Arch. Neurol. Psychiat.*, 35: 1002, 1936.
161. TOWER, S.: Extrapramidal Action from Cat's Cerebral Cortex: Motor and Inhibitory. *Brain*, 59: 408, 1936.
162. VONDERAHE, A. R.: Histopathologic Changes in the Nervous System in Peptic Ulcer. *Arch. Neurol. Psychiat.*, 41: 871, 1939.
163. VONDERAHE, A. R.: Changes in the Hypothalamus in Organic Disease. *A. Research Nerv. & Ment. Dis., Proc.*, 20: 689, 1940.
164. WARDEN, C. J.: *Animal Motivation*. Columbia University Press, New York, 1931.
165. WATTS, J. W. and FULTON, J. F.: The Effects of Lesions of the Hypothalamus upon the Gastro-Intestinal Tract and Heart in Monkeys. *Ann. Surg.*, 101: 363, 1935.
166. WHITE, J. C.: Autonomic Discharge from Stimulation of the Hypothalamus in Man. *A. Research Nerv. & Ment. Dis., Proc.*, 20: 854, 1940.
167. WINKLER, C. and POTTER, A.: *An Anatomical Guide to Experimental Researches on the Cat's Brain*. Verluys, Amsterdam, 1914.
168. WOODWORTH, R. S. and SHERRINGTON, C. S.: A Pseudodffective Reflex and Its Spinal Path. *J. Physiol.*, 31: 234, 1904.
169. YACORZYNSKI, C. K. and GUTHRIE, E. R.: Comparative Study of Involuntary and Voluntary Conditioned Responses, *J. gen. Psychol.*, 16: 235, 1937.
170. YAKOVLEV, P. I.: Neurological Mechanisms Concerned in Epileptic Seizures. *Arch. Neurol. Psychiat.*, 37: 523, 1937.

REPORTS OF PARTIAL FRONTAL LOBECTOMY AND FRONTAL LOBOTOMY PERFORMED ON THREE PATIENTS: ONE CHRONIC EPILEPTIC AND TWO CASES OF CHRONIC AGITATED DEPRESSION

WILLIAM JASON MIXTER, M.D., KENNETH J. TILLOTSON, M.D.
AND DAVID WIES, M.D.*

IN 1936 Egas Moniz (8) reported an operation for the treatment of certain psychoses by subcortical destruction of pathways in the frontal lobes. The fibre tracts severed in this way are those leading back from the most anterior frontal convolutions, the so called prefrontal lobe. The leucotome used was so constructed that it would cut a core about one cm. across in the white matter, thus severing the fibres twice. Two or three cores were made in each frontal lobe three to four cm. posterior to its tip. It would seem that all the short fibre tracts connecting adjacent gyri would be spared and also some of the long central tracts might well escape. It is our understanding that this technique was devised with the purpose of performing only a partial section of the fibre tracts leading back from the tip of the frontal lobe.

In this country Freeman and Watts (5) have reported the results obtained by operations on sixty odd patients suffering from various types of psychoses which, they state, were successful in about seventy per cent of the cases so treated. They used the Moniz technique in some of their cases, modified by a different avenue of approach and also by the use of a long, thin, blunt-edged instrument similar to the

elevator used in operations on the nasal septum.

Lysterly (7) also has published a series of cases operated upon with a similar, although not identical, technique.

The Moniz-Freeman-Watts operation must be similar in its effect to amputation of the anterior portions of both frontal lobes as described in the well-known cases of Brickner (2), Acklerly (1), Penfield (10) and others. The effect of severance of some of the fibre tracts in the frontal lobe would of necessity be less complete than ablation of the cortex from which and to which these fibre tracts run. There also should be far less scar tissue formation.

Most of the successes reported by Freeman and Watts (5) in their series were in cases in involutional and agitated depressions and in very severe compulsive neuroses. They reported much less benefit in cases of schizophrenia. This work has interested us greatly because of the effect produced in the first case we report, although the operation was done for epilepsy and not mental disease, and also because of two tumor cases in whom a large amount of tissue was removed from both frontal lobes during radical operations for brain tumor. Both were definitely slowed down mentally following the operation. In the one having the most extensive removal, almost all initiative was lacking as long as he lived.

* From the Neurosurgical Service of the Massachusetts General Hospital and the staff of the McLean Hospital.

Electroencephalography was carried out in all three of these patients before and after operation, and case 1 has already been discussed by Lennox (6). The electroencephalographic findings in cases 2 and 3 will be discussed in the paper in this journal by Mrs. Pauline A. Davis (7).

We have been slow to use frontal lobotomy as we have felt that a destructive operation without demonstrable brain lesions was a radical procedure. During the last three years we have selected two patients who seemed to present characteristics that made them suitable subjects for such an operation. The criteria that we felt we required for these first cases were: 1) a well-established diagnosis of agitated depression, 2) an absence of mental deterioration, 3) a chronic state with no prospect of improvement under the usual forms of treatment, and 4) such severe mental disturbance as to require continuous and permanent institutional care. These two patients as well as case 1 were subjected to careful study before and after operation in order that we might measure as accurately as possible the effect of the procedure on the mental state of the patient.

CASE 1

A boy of 17 was admitted to the Massachusetts General Hospital in October because of increasing epileptic seizures, unimproved by medical therapy. X-ray showed marked frontal endostoses of the skull. The operations disclosed atrophied and adherent frontal lobes. Both were removed with resulting decrease in epileptic seizures and marked improvement in mental symptoms. The irritability, "ugliness" and temper outbursts which had been increasingly troublesome for two years were greatly reduced in number and his general behavior became more placid and cooperative.

The patient was referred to one of us for operation, by Dr. Stanley Cobb, in October 1936. This patient had had a remarkable record of examinations and treatment in various clinics from Boston to Los Angeles during the last eleven years. At the age of five he was struck by an automobile, his chest was bruised and his left hip was dislocated; two weeks later he began to have "nocturnal attacks of terror" in which he would pant, moan and grasp the bedding. Eight or nine months later these attacks began to occur in the day; if startled, he would drop anything he might be holding, grasp some support, sway and look vacant. Such attacks also occurred if he were faced with some task or problem too difficult for him. Five years later, at the age of eleven, he began to have grand mal, usually at night. These were recognized as epileptic because they were usually initiated by a cry, and severe muscular spasms, largely flexor, causing "frog-like" postures, sometimes followed by slight clonic jerks and usually accompanied by incontinence. Unconsciousness lasted from one-half to three or four minutes and was followed by a short confusional period or a brief deep sleep.

Dr. William Lennox examined him during the next year (August 1931) and found no neurological abnormalities, no mental deterioration, normal skull X-ray and normal spinal fluid. He made a diagnosis of "grand mal and equivalents." During the next years he was treated by an endocrinologist, largely with pituitary extract; he was growing fast and was having more seizures. Also the family noticed memory defects; he could not go to school because of his fits. Later he was treated with phenobarbital with little benefit. An X-ray in September 1935 was reported normal, and a pneumoencephalogram indicated slight adhesions over the vertex and

slight atrophy. In March 1936 he was carefully studied by Dr. Lennox once more. At this time there was definite mental deterioration and periods of



FIG. 1. Specimen removed in Case 1.

impulsive behavior that at times frightened his family. Electroencephalographic studies have been reported by Lennox *et al.* elsewhere (6). Acidosis by starvation was of slight benefit and intravenous brilliant vital red was tried as therapy with only mediocre results, Cobb (3). In June the patient came to the Massachusetts General Hospital for consultation. At that time a stereoscopic X-ray of the skull showed definite endostosis of the frontal bones. These were so conspicuous and the case had such a bad prognosis that operation was advised. The family preferred to postpone this until autumn. The patient was readmitted in October 1936. He was having more attacks than ever, sometimes three a day and an average of one grand mal per day. These attacks were variable in type; some consisted of a brief slumping to the floor ending with slight muscular spasms, others were severe motor fits largely postural with little if any clonic jerking, others had more clonus but never the typical convulsion. At times he became sullen and irritable, even making threats and

appearing aggressive. He could not be left alone because of his tantrums when he "did not know what he was doing," and "would prowl through the house stealthily," make misidentifications and frighten people. He stuttered and seemed to have difficulty in finding words. There was definite memory defect and much apathy between his periods of irritability.

October 8, 1936. Resection of right frontal lobe for epilepsy. Coronal incision. Large frontal osteoplastic flap turned down. The flap was framed so that it went across the midline exposing the dura to the left of the longitudinal sinus. Dura opened to the right of the longitudinal sinus and reflected upward. The frontal lobe appeared definitely scarred and there were numerous lakes of cerebro-spinal fluid under the

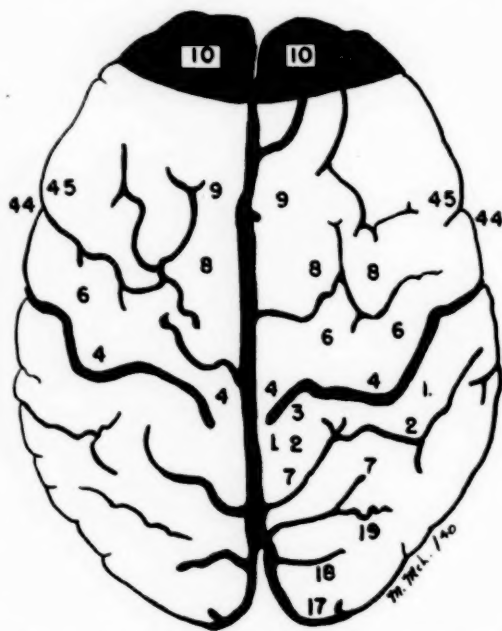


FIG. 2. Sketch indicating approximate amount of tissue removed in Case 1.

arachnoid. The anterior pole was definitely adherent to the dura low down. This was dissected clear and, with the electro-surgical unit, an incision was made in the frontal lobe running diag-

onally backward and inward. This incision began about three centimeters back from the anterior pole on the right and ended about two centimeters back at its inner surface. It was carried down to the lower surface of the frontal lobe, thus removing a piece of the anterior end of the frontal lobe about two and one-half centimeters in thickness. The ventricle was not opened. There was very little hemorrhage which was controlled with diathermy and silk ties, and the wound was closed in layers with silk without drainage. Specimens of the endostoses were chipped off.

The specimen weighed 23 grams and showed edematous and shrunken nerve cells. The endostoses appeared to be normal bone.

After the operation on the right frontal lobe the number of attacks dropped to two a week and the father reported that the patient was quieter and more amenable to discipline.

A Stanford-Binet test was given by Dr. Robert Young on December 22, 1936 with the result that the patient showed a mental age of eight years and ten months, that is, an I.Q. of 63.

On December 30, 1936 there was a partial amputation of the left frontal lobe. The frontal lobe showed considerable atrophy with a lake of spinal fluid over it and seemed to be scarred the same as the right frontal lobe. There was one small exostosis, but not nearly so many as on the right side. The frontal lobe was amputated in a similar manner as the right frontal lobe, care being taken not to go back too far on the outer side, in order to keep away from the speech center. The ventricle was not opened in this procedure.

January 10, 1937. Since recovery from the operation he had been on the whole cooperative, but several times resented orders from the nurse and swore at her.

January 12, 1937. He seemed placid

and quiet, and his speech was better.

January 15, 1937. Mental examination showed slight slowness and hesitance of speech. The mood was pleasant but he was apathetic and his concentration was poor.

January 19, 1937. Dr. Young again examined the patient and found him more cooperative than on December 22. He went through the test more rapidly, but made a slightly lower score, that is eight years and eight months, giving an I.Q. of 62.

January 22, 1937. Discharged to home.

January 29, 1937. The father reported: "Since the second operation he has been just lovely. No one could see anything wrong except that he is mentally slow. There are none of the nervous explosions, stubbornness or ugliness."

February 5, 1937. His personal habits had improved. He bathed, was orderly, and did not soil himself.

February 25, 1937. The patient had been reading, doing a shop project, and playing checkers. His fits were much less frequent and less severe, coming about once in ten or fourteen days.

March 15, 1937. His father reported: "Since the attack of February 25 he has not had any of these little nervous seizures, but has been as calm as any normal person. His attitude in general has been very good, and at the times he has been provoked or ugly in his reply, it has been a pleasure to us to see how much nicer he corrects himself and how he seems to be reasoning about it. He said several times that he wanted to say a certain thing, he meant to make a certain kind of reply, but he would say, 'There was something inside of me that told me not to do it,' this, I take it, is very encouraging. He has been improving a little every way, I think, reading a little more and helping many ways about the house. He doesn't show fa-

tigue as quickly as before, is more interested in people and general conditions, has improved a little in his games so that I seldom win a game in checkers any more, can go out places and not fall asleep at once as he used to do, etc. Twice he became a little ugly after being embarrassed, as he thought, without cause or just cause and was inclined to make me promise something if he would do as I requested. In both instances I patiently held to my position and presented every possible angle of the case to him in a reasonable way, with the result that he surrendered and I won a decided victory. Afterwards he was just the same lovable boy as before, and it didn't seem to unnerve him and make him worse in either instance. This, too, I consider very promising just now."

March 27, 1937. He had improved and had gained weight. He had twice shown unwarranted explosions of anger.

April 6, 1937. His mother reports: "He's got a different attitude towards everything. He's my right hand man now! He does everything, works around the house and garden. He used to get a nasty disposition when he was a little tired. Now he's nice in his reactions. He's been sweet, just a pleasure to have in the house—where he used to be awful before the operation. That is no exaggeration at all. Our friends have all noticed it. Everyone is amazed. He had a funny streak when he used to talk in on every speck of conversation. He doesn't do that any more; he keeps his place and the last two weeks have been the best of all. Sometimes he gets wound up and talks too much."

May 4, 1937. Stanford-Binet test was again given by Dr. Young. He showed much less speech difficulty and completed the test more quickly. His mental age was ten years and one month, a marked improvement over the December and January tests.

On May 8 he tried to take a short bicycle ride and was lost for twelve hours.

The patient did well until August when he was tried at a camp. There he reacted badly to teasing by younger boys and was taken out. At home he had some ugly spells. The father wanted to go on a vacation so the patient was sent to a large hospital for epileptics where he had several fights with attendants and patients. In November he was transferred to another institution where certain things irritated him, so on November 1 he was transferred to a mental hospital where, according to the last reports, he got along well.

November 10, 1938. His father writes: "Tom is now in much better spirits, works outside frequently, goes to the gymnasium several times a week, plays tennis occasionally and cooperates much better all around. He hasn't been in any real trouble for several months. All of this is due, I feel, to the reduced number of seizures he is now having—at the last report, "only a couple a month."

CASE 2

The second case is that of a 58-year-old, single male. The family was of old New England stock and certain individuals in the present generation had shown evidence of emotional instability.

From early age the patient was always quiet, passive, unsociable and had practically no interests. His school record was fitful due to his lack of cooperativeness with the group. His only goal was to make money in business. Several jobs given to him with the help of his father failed, but at 28 he borrowed a large sum of money, set himself up in business and was successful for seven years. He was always inclined to put on a grand manner. He was aloof,

unapproachable, fastidious and polished. After his failure as a soldier in the World War he never was able to reinstate himself in business. He began to drink excessively and take bromides, yet he still attempted to keep face by keeping a desk downtown at which he could sit.

In 1927 the patient was moody and drinking considerably, as well as taking drugs. He was taken to a sanitarium on June 29, 1927 after attempting suicide by cutting his throat and left wrist. He left against advice on July 17, 1927. He gradually deteriorated in his habits and showed little ambition. He was depressed from time to time. On February 5, 1936 he was admitted to another sanitarium because of excessive alcohol and bromide intake. He was depressed, agitated and had ideas that people were trying to take away his property. He was complaining, childish and could not be pleased. He left the hospital to enter the first sanitarium again on February 18, 1936. He was still depressed, irritable, demanding and restless. He improved somewhat, but was transferred to McLean Hospital on May 4, 1936. His diagnosis here was manic-depressive depressed. He was discharged to a farm in Vermont on December 11, 1936. There he was resentful of confinement, moody, restless showed a lack of initiative and was inclined to be depressed and self-accusatory. He was transferred to a fourth hospital in March 1937, but made only temporary improvement and returned to McLean Hospital in June 1937. Here his mental status was that of depression with agitation; he picked at his fingers and clothes and showed a stereotyped repetition of phrases. He had lost considerable weight but was otherwise in good physical condition. It was felt that since he had no recourse to alcohol or drugs, a marked psychosis of the agitated involutional type was uncovered.

Mental tests at this time were not satisfactory, but he showed no impairment of recent or remote memory. When a lobotomy was decided on, the patient himself practically insisted that it be done.

An operation was performed on March 24, 1938 as follows: A small opening was made in the left temporal bone 3.25 centimeters back of the edge of the orbit and 5 centimeters above the zygoma. The dura was incised and a ventricle needle inserted which was directed toward a similar point on the other side of the patient's head. At a depth of about 7 centimeters the resistance of the falx was recognized and the needle withdrawn. A length one centimeter less than that measured on the needle was laid off on a long, thin bladed nasal septum elevator and the elevator inserted to this depth in the same direction as the needle. The elevator was then swept slowly and gently upward until the resistance of the vertex was encountered. It was then swept downward until the resistance of the roof of the orbit was met. During this procedure a resistance was met in sweeping the elevator downward which was thought might be due to a blood vessel. The elevator was withdrawn until it slipped beneath this obstruction and then reinserted to the same depth as before. The same procedure was then carried out on the right side. The leucotome was not used on either side. There was very little bleeding at any time. The wounds were closed in layers with silk.

Recovery from the operative procedure was uneventful. At no time was there any evidence of increased intracranial pressure. The routine neurological examination showed no motor weakness, no change in reflexes and no aphasia.

After the operation the patient was quieter and more able to talk normally.

From time to time fears and suspicions returned, but he managed to keep them under cover fairly well.

Intelligence tests informally done on May 2, 1938 revealed little difference from his pre-operative ability, although he seemed less alert and slower to respond. He was capable of completing the average adult tests. Although somewhat more sociable, he would become angry if forced into activities.

The patient was released on visit August 11, 1938. Although he was asked several times to return to the hospital for a check-up he refused to comply because he "did not want to bring back unpleasant memories." He was discharged from visit on August 10, 1939. Four months later his brother wrote, "He is perfectly well and his condition is better, if not the best that it has been for years. All the symptoms of worry, depression, and agitation have disappeared. He now appears quiet and calm, but it is true that he lacks a certain amount of energy and drive that he possessed as a younger man. One important change in his personality has been shown. For many years he had a strong desire or inclination to take liquor or drugs. He now has no interest in either of these. He has renewed his old acquaintances, whom he devotes himself to meeting normally and naturally. He spends some time reading current literature. He attends to his religious duties. He has even talked about getting a job, and has discussed with me the advisability of his purchasing the home he now lives in. He talks a good game, and that is characteristic of him. He always talked more than he actually accomplished."

Finally Dr. Stanley Cobb, who had seen the patient several times in consultation, was able to persuade him to return for re-examination as the patient wished to dispense with his guardian.

On March 5, 1940 the patient was

seen by Dr. Cobb who reported the interview as follows: The patient returned because he wished to have the guardianship removed and, although he had refused to see any physicians during the last year, I insisted that I would not write a letter without examining him and that I looked on his fear of seeing a physician as a sign of abnormal mental reaction. This message when transmitted by his brother brought an immediate answer from him and an appointment was made. On entering the examining room this morning he appeared quiet, dignified and with a rather exaggerated exactness of speech and inclination. He was evidently on his best behavior. He then told me in response to my asking about his situation that his housekeeper was hurt by an automobile and her arm broken, and also that his mother was ill. These worries distressed him but he did not feel upset as he used to or behave in an agitated way. He also stated that he took no liquor. His mood was calm and normal. His stream of talk was slow, measured, rather pedantic and with adequate expression. Propositional speech was orderly and expressive.

His memory was good for recent events. "My memory is particularly good." "334, Brattle Street, woodchuck"—these three things he remembered for ten minutes. He remembered a French proverb and used it correctly. He subtracted 7 from 100 as follows: "93, 86, 79, 72, 65, 58, 51, 44, 37, 30, 23, 16, 9, 2, and from 2 not even you can do it." (laughs)

His special preoccupation is that he wants to buy a house. He feared that I would bring in "a gang from McLean" and feared another electroencephalogram would be taken by "Mrs. Davidson." "I hate all association with my illness."

Insight. "I spent two years and a half in six of those places. It was very sor-

rowful. But I have no rancor. It frightened me so that I have no desire to ever take a drink again. My soul is damaged but the head is all right."

Orientation. He recognizes the examining physician. He knows the hospital and finds his way about the city accurately, but on leaving my office he hesitated about which direction to take, looked confused and then was told to turn to the left. He recovered his poise immediately, bowed and thanked the secretary. On leaving her office he again

slowly and thoughtfully:

I have attended Mr. — (the patient) several times since February 1936 and am thoroughly conversant with his case.

I definitely believe that he is capable of managing his personal affairs completely and I emphatically desire the termination of the term of his guardianship at the earliest possible date.

CASE 3

The third patient is a 62-year-old male. This patient, admitted at the age

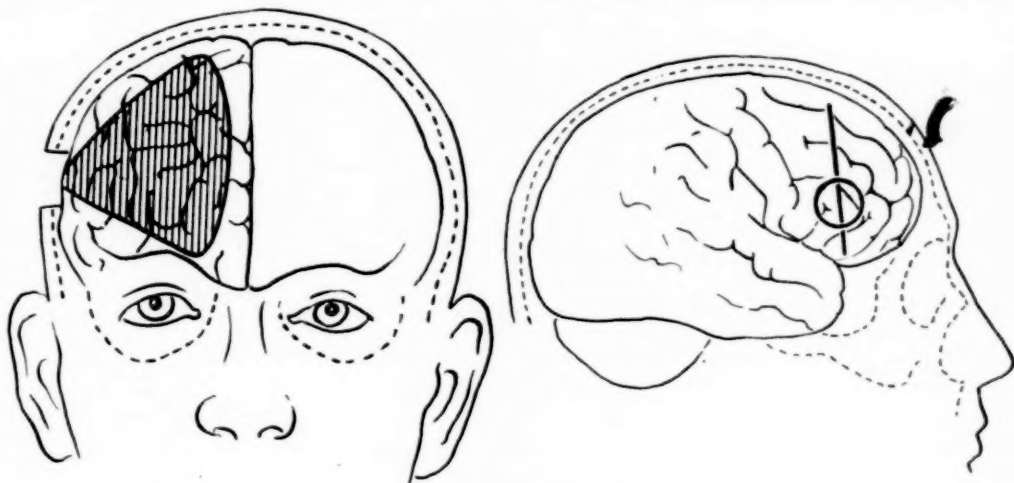


FIG. 3. Diagrams indicating approximate extent of sections carried out in Cases 2 and 3.

stopped in the hall, looked around with a puzzled, confused expression on his face. The secretary pointed out the way to the waiting room, and he said quickly, "Of course," and went confidently on his way. In the waiting room he assured the secretary that he knew his way out of the hospital. He said the date was March 6, and the year 1940. (It was March 5, 1940.)

After the examination I asked him about his affairs and the reasons why he wanted to have the guardianship removed. He told me with accurate detail the situation as I had already heard it from his brother and then when I asked him what sort of letter he would like to have me write, he dictated the following

of 55 in 1932 with a diagnosis of manic-depressive depressed, came from an intelligent and successful family of good standing in the community. One daughter was retarded and deformed, and his wife was a victim of chronic mental illness. The patient was a college graduate, and was successful in business during the war. Respected, religious, popular, sociable, he finally met severe business reversals and several of his undertakings failed.

He finally attempted suicide on June 11, 1932 by cutting his left wrist, and was taken to the hospital where he continued very depressed and suicidal. He became nearly inaccessible and very agitated. In 1934 he developed a shuf-

fling gait, jargonaphasia and smacked his lips noisily. He became less suicidal. He played golf, croquet or read, but communicated intelligibly with no one at the hospital. In July 1938 he developed a duodenal ulcer which later healed. There was some suspicion of mild cardiac disease. Electroencephalograms by Mrs. Pauline A. Davis revealed a left temporal focus of abnormally slow waves and less constant ones all over the cortex. A neurological examination was unsatisfactory. Pneumoencephalogram revealed mild left parietal and occipital atrophy. This was considered to be a pre-senile change, superimposed on an affective psychosis. Because of the seeming hopelessness of the situation, it seemed advisable to attempt a lobotomy, although we did not feel so optimistic in this case as in the preceding one.

An operation was performed on February 2, 1939 and was carried out in a similar manner to the operation in case 2. Owing to the dilation of the left ventricle the anterior horn was entered on that side with escape of cerebrospinal fluid. Otherwise the procedure was uneventful.

The patient was drowsy after the operation, but roused the following morning and talked normally for a few hours. After that he talked gibberish as before the operation while he was at the Massachusetts General Hospital. There was some evidence of increased intracranial pressure for a few days and we wondered whether there might have been some intraventricular bleeding. The evidence was not severe enough to warrant lumbar puncture and there was no evidence of localized pressure. At no time did he show any weakness, reflex change or alteration from the gibberish he used before the operation.

At the end of two weeks he was in good physical condition, and seemed less agitated mentally. The patient was

returned to McLean and given a room in a quiet cottage and there under strict, rather forceful supervision, as recommended by Myerson and Tillotson (10), he gradually, over a period of months, adjusted himself to a fairly normal and active existence, including reading, golf, pool, billiards, rides, visits and movies. He became friendly and cooperative, but conversed little. He entirely lost his peculiar jargonaphasia, and walked more normally, although his carriage remained somewhat stiff. Physically he improved and gained weight. He then was transferred to an open ward. He remained passive and displayed no warmth of feeling. He left the hospital on a short visit August 3, 1939, and in September he left on prolonged visit.

We had done no special psychological tests during his acute psychosis, but it was apparent from his college and business record that he was an intelligent and capable person. An Otis mental test on June 29, 1939 revealed an I.Q. of only 91 with failures in definitions, comparisons, analogies and opposites. Arithmetical ability was preserved.

The Rorschach test performed by one of us (D.W.) revealed a mental torpidity, absence of imagination or drive, which must represent remnants of depression. There were, however, features of perseveration, low contact with popular conceptions and compensatory effort at forming larger syntheses which pointed to an organic deteriorating process. How much cerebral damage, already incurred before the operation, was responsible for these findings and how much due to the lobotomy is beyond evaluation.

The patient was discharged on visit August 20, 1939. He went to Maine and later to Cape Cod on a vacation with a male nurse. He continued to improve and joined in a certain number of prescribed activities. He showed little

spontaneity or initiative, however, and tended to be seclusive and depressed. He came back to the hospital January 6, 1940 for a check-up. He was now living alone, eating his meals out and finding life not too interesting. His depression continued in full force. He admitted no improvement, hope or interest, yet he reacted in an unusual way towards these depressive ideas insofar as he did not seem to be suicidal or actively disturbed by these feelings. There was some tension shown by slight tremors of his hands, but his speech although monotonous and taciturn showed no evidence of his former gibberish and his posture and gait were normal. He was friendly although not cordial, cooperative although rather passively so and somewhat abrupt. A physical examination showed a blood pressure of 170/96 but not much vascular sclerosis. Vibration sense was not elicited in the lower extremities. There was no evidence of ataxia, aphasia, forced grasping or groping. Pyramidal tract signs were absent and there seemed to be no changes in the autonomic system. His feet were cold but showed no color changes. There had been no incontinence. There never has been any hypomanic behavior such as was seen in Brickner's 4 cases. His judgment in ordinary affairs seemed adequate. An Army Alpha test on January 2, 1940 showed no change in the intelligence level from the Otis mental test of June 29, 1939. He did particularly poorly in those tests requiring higher synthesis, such as analogies, serial numbers, and complex judgment requiring the simultaneous attention to several different functions. He did well in tests requiring simple following of directions, simple calculation and in questions of common sense and general knowledge.

The Rorschach test was repeated. He did not remember his previous responses (which may be due to faulty

recent memory). It was similar to his previous Rorschach, giving a picture of depression with even more marked rejective trends and mental torpidity.

DISCUSSION

One case of bilateral ablation of the anterior portions of both frontal lobes and two cases of agitated depression treated by bilateral prefrontal lobotomy are presented, with marked improvement in compulsive motor symptomatology, agitation and social relationships. No definite neurological changes could be attributed to the operations. Psychologically the structure of the psychosis and the underlying personality do not seem changed in the two cases of agitated depression. The depression remains in the background, but, because of a peculiar lack of concern with his endogenous psychological difficulties, ideas and emotions previously strongly charged seem no longer to motivate the patient to grossly psychotic behavior. Destructive effects of the operation are loss of spontaneity, initiative and interest with certain spotty losses in recently formed engrams. There is deficient thoughtfulness about the future with lack of the need to act or worry. Simple emotional responses remain—with adequate response to external situations. Remote memory seems undisturbed as does general knowledge.

These two cases of agitated depression show in a general way the relief of symptoms and the production of symptoms in accord with the observations of Freeman and Watts (5, 11). Among the psychotic symptoms relieved were negativism, perseveration, extreme agitation, laziness, indifference and unsatisfactory physical status. The gain in weight and increase in appetite was marked in our patients. The suspiciousness and mannerisms, as well as the fleeting delusional content, irritability

and agitation, that characterized the clinical pictures in the two patients reported upon, entirely disappeared. In one case alcohol and drugs were no longer used.

In discussing the immediate effects of this operation, the abolition of anxiety and nervous tension was noted in both of our depressed patients with a partial return of the sense of humor. The remote effects, as stated by Freeman, indicate that it may require six weeks to a year for patients to recover sufficiently to resume their occupations. It has been stated that as "a positive distinction, one might state that the function of the frontal lobes is to retain simultaneously in consciousness a number of concepts differing in temporal relationships. While the patient with frontal lobe defects may be incapable of synthesis or of planned initiative, it is probably beyond the scope of the argument to declare that the frontal lobes furnish the motive power, the initiative and the energy of response of the personality." (2, 10). That the frontal lobes are clearly concerned in emotional activity can hardly be doubted from observation of these patients. The psychosis is not "cured," but an affective "desensitization" seems to take place which lessens the hypermotility and normal concern. The effects seem to be lasting.

We should like to emphasize the possible importance of removing these patients to a surgical hospital with the announced intention to the patient that the cause of their symptoms was to be removed. Perhaps more important is the activation and motivation therapy and a complete change of hospital environment with an entirely different program. Although the functions of synthesis seem to be definitely a frontal lobe phenomenon, apparently this destructive operation has not destroyed the ability to reorganize the elements of

the personality to a considerable functional level.

Since there are many cases of agitated depression in whom the ordinary psychiatric treatments for five to ten years has proved of no avail, and in whom shock therapy may be contraindicated, we recommend that lobotomy be given further trial in selected cases, and that complete neurological, psychiatric, psychometric and electroencephalographic studies be made pre- and post-operatively.

We realize the danger of hemorrhage and the danger of opening the anterior horn of the ventricle. (This occurred on the left side in case 2.) We believe that the use of a long, thin, blunt-edged instrument should be as effective as Moniz leucotome. We first saw it used by Watts in conjunction with the use of the leucotome, hence our only modification of his technique is to depend entirely on the blunt knife instead of employing both it and the leucotome.

Such an operation as this must necessarily carry not only a definite mortality but also the definite danger of causing permanent damage to speech and motor power and also the possibility of convulsive disorder. We feel it should be employed only in patients who are completely disabled by their infirmity and in whom the disability bids fair to be permanent.

SUMMARY

One case of chronic epilepsy and two cases of agitated depression treated by frontal lobotomy or partial lobectomy are presented from the clinical point of view with implications as to frontal lobe function.

BIBLIOGRAPHY

1. ACKERLEY, S.: Instinctive emotional and mental changes following prefrontal lobe extirpation. *Amer. J. Psychiat.*, 92: 717, 1935.
2. BRICKNER, R. M.: The intellectual functions of the frontal lobes; a study based upon observation of a

- man after partial bilateral lobectomy. Macmillan, New York, 1936.
3. COBB, STANLEY, *et al.*: Brilliant vital red as an anti-convulsive. *J. nerv. ment. Dis.*, 85: 438-441, 1937.
 4. DAVIS, P. A.: Electroencephalographic studies on three cases of frontal lobotomy. *Psychosom. Med.*, 3: 15-27, 1941.
 5. FREEMAN, W. and WATTS, J. W.: Interpretation of functions of the frontal lobe based upon observations in 48 cases of prefrontal lobotomy. *Yale J. Biol. Med.*, 11: 527-539, 1939.
 6. GIBBS, F. A., GIBBS, E. L. and LENNOX, W. G.: Epilepsy: a paroxysmal cerebral dysrhythmia. *Brain*, 60: 377-388, 1937.
 7. LYERLY, J. G.: Prefrontal lobotomy in involutional melancholia. *J. Fla. med. Ass.*, 25: 225-229, 1938.
 8. MONIZ, EGAS.: Tentatives operatoires dans le traitement de certain psychoses. Paris, Masson, 1936.
 9. MYERSON, A. and TILLOTSON, K. J.: The practice of the total push method in the treatment of chronic schizophrenia. *Amer. J. Psychiat.*, 95: 1197-1213, 1939.
 10. PENFIELD, W. and EVANS, J. P.: Frontal lobe in man: a clinical study of maximum removals. *Brain*, 58: 115-133, 1935.
 11. WATTS, J. W. and FREEMAN, W.: Psychosurgery: effect on certain mental symptoms of surgical interruption of pathways in the frontal lobe. *J. nerv. ment. Dis.*, 88: 589-601, 1938.

ELECTROENCEPHALOGRAPHIC STUDIES ON THREE CASES OF FRONTAL LOBOTOMY

P. A. DAVIS*

IN OCTOBER and November, 1936, at McLean Hospital, electroencephalograms (EEG's) were taken on two male patients, both between 55 and 65 years of age. The physiological activity of the brain was thus recorded from midline positions in the frontal, precentral and occipital areas. A third patient was recorded three times within a four-month period before lobotomy and a fourth time just three weeks following his operation. The EEG's included records from right, left and midline regions of the frontal, precentral and occipital areas.¹

The first patient (McL-27) was again studied electroencephalographically four months before lobotomy. Positions on the left and right sides of the head were included in addition to the original midline positions. In these pre-operative records (see Figs. 1 and 2) the EEG revealed less than the usual differences

ordinarily seen between frontal, precentral and occipital areas. There was no asymmetry between the left and right sides of the head (see Fig. 2) and no evidence of specific lesions or localized physiological disturbances. The pattern was one of diffuse low-voltage activity with both slow and fast frequencies represented. No X-ray plates of the skull or pneumoencephalograms were made.

As a boy this patient was lonely and morose, but of better than average intelligence. As an adult he was quiet and lethargic, but his peculiarities and eccentricities were well recognized. He became an excessive drinker for a period of twenty years and also used many sedatives. Since 1935, he was admitted to mental hospitals on five occasions and spent approximately three years in hospitals before admission to McLean Hospital. Between admissions he once attempted suicide by cutting his neck and left wrist. At one hospital his diagnosis was "chronic alcoholic psychosis with deterioration."²

On admission to McLean Hospital on May 4, 1936, his neurological examination was recorded as negative except for a "nicking in the arteriovenous junction in the margin of the optic discs." His behavior was described as agitated and depressed. He walked about wringing his hands and picking the skin of his hands. He asked repeatedly about privileges and freedom and discussed little else. During his sojourns

* From the Department of Physiology, Harvard Medical School and McLean Hospital, Waverley, Mass.

The author is greatly indebted to the Department of Physiology of the Harvard Medical School, aided by a grant from the Josiah Macy, Jr. Foundation, for financial support and apparatus. Indebtedness also is acknowledged to her husband, Dr. Hallowell Davis, for his excellent criticism and help in the preparation of the manuscript and the figures, and to Mrs. J. C. Leighton for her valuable suggestions. As Research Fellow at McLean Hospital, the author wishes to express great appreciation for the privileges of research and freedom of access to all hospital facilities.

¹ In a report by Drs. Mixter, Tillotson, and Wies of these same cases (appearing in this issue) McL-27 is their Case 2 and McL-55 is their Case 3. The third patient (McL-234) referred to in the present paper is not reported in their paper, but was added here because the post-lobotomy EEG data have just become available as this paper goes to press.

² The chronic effects of alcohol may have contributed to the lack of differentiation of activity between different areas seen even before operation, if we may be guided by the generalized distortion of pattern that we have seen in some serious cases of alcoholism (unpublished observations).

outside the hospital his behavior had been much the same. When he became free of the symptoms of alcohol and sedatives, his psychosis was diagnosed as a marked agitated depression.

During the winter of 1937-38 he was still agitated, worried, pacing up and down, picking at fingers and clothes, and repeating stereotyped questions about getting out of

and 2). The lobotomy did not alter the patient's characteristic EEG. The electrical activity of the cortex was left essentially unchanged and unimproved by the operation. The patient's behavior, attitude, and mental condition, as observed in the laboratory before and two weeks after operation, also ap-

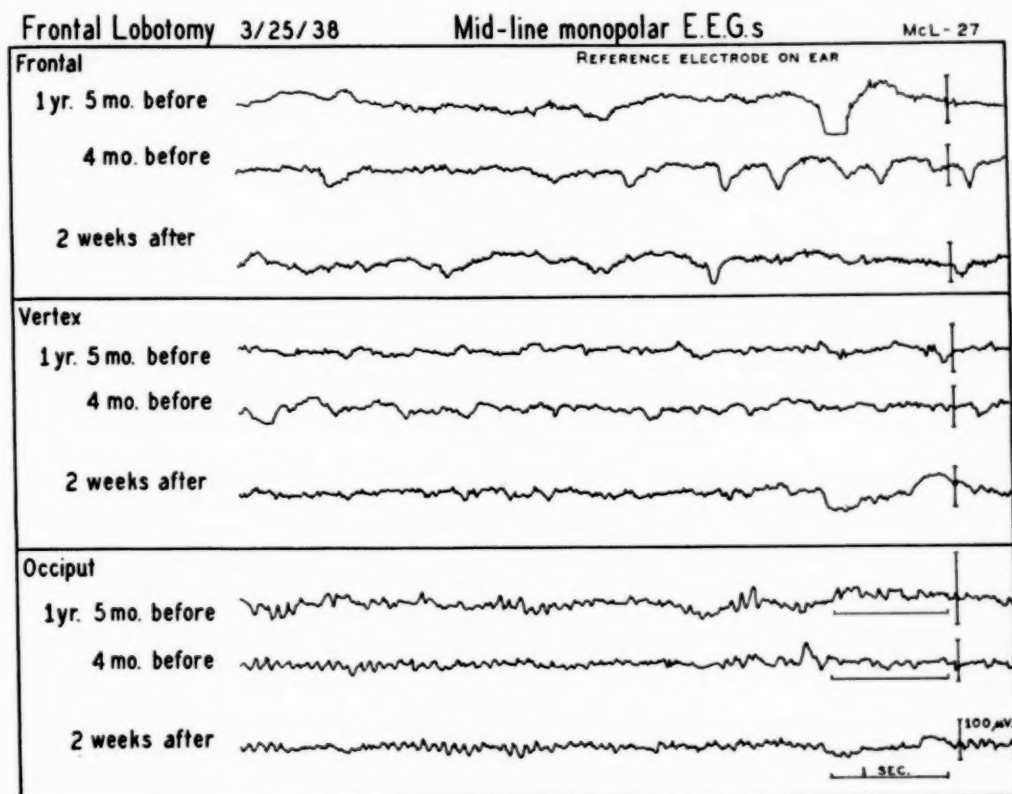


FIG. 1. EEG's of MCL-27 before and after frontal lobotomy.

the hospital. Anticipation of the operation for frontal lobotomy caused improvement in his behavior and shifted his attention and questions, which were also stereotyped, to the coming event.

Bilateral frontal lobotomy was performed by Dr. W. Jason Mixter on March 25, 1938. An EEG taken two weeks after operation, from the original placements, showed no essential changes from the preoperative pattern even in the frontal region (see Figs. 1

and 2). The lobotomy did not alter the patient's characteristic EEG.

For three months following operation the hospital records describe the patient's behavior as still highly agitated. The improvement seen while he was anticipating his operation was no longer evident according to the hospital record. He still picked his skin and continuously asked for reassurance in regard to leaving the hospital. Psychological tests showed no difference from his previous tests except that he was less alert and slower to respond.

In spite of these data from the hospital

records he improved sufficiently to leave the hospital four months following operation. He continued to improve steadily outside, where he was very happy, and became increasingly more calm and normal. Although two years have now elapsed, no follow-up EEG has been possible. Evidence of marked improvement is shown by the fact that he has since maintained his ability to take care of himself and go about inde-

special evidence of deterioration or of loss of memory.

The second patient (McL-55) was first recorded in November 1936 in the same manner as McL-27. His second and third EEG's were taken two years later, both in November 1938. A fourth EEG was taken on March 20, 1939, seven weeks after a frontal lobotomy

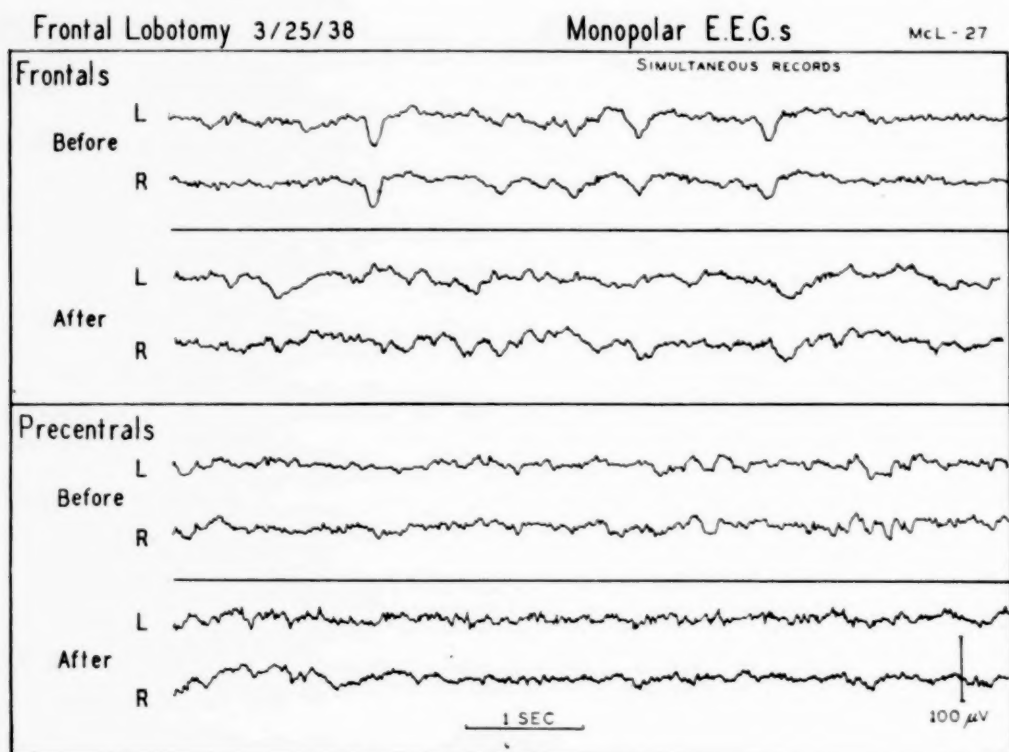


FIG. 2. EEG's of McL-27 before and after frontal lobotomy.

pendent of supervision, which previous to his operation was impossible. His personality retained its characteristics and his behavior showed he was no less alert.

Briefly, this case may be summarized as follows. Until approximately two and one-half years prior to operation the patient had varied sufficiently in his condition and behavior to be able to remain outside of the hospital. He then developed a severe psychosis. Following the lobotomy, tests of psychological and intellectual functions given at McLean Hospital and at the Massachusetts General Hospital revealed no

performed by Dr. W. Jason Mixer on February 2, 1939, at the Massachusetts General Hospital. A final record was taken eleven months post-operatively in January 1940. All but the first record included studies of left and right sides of the head and numerous control studies by different methods, *i.e.*, monopolar, bipolar and triangle connections [cf. Davis, (2)] to identify and eliminate possible artefacts.

An outline of certain aspects of the pa-

tient's clinical condition is necessary because of its direct bearing on the interpretation of the EEG's.

In June 1932, at the time of admission to McLean Hospital, the patient was suffering from a knife wound on his arm made in an attempt at suicide. He also had two severe scalp injuries, self-inflicted by dashing himself against the radiator after admission to a general hospital to which he had been taken after his suicidal attempt. When committed to McLean Hospital his mind was wandering and he was vague and delirious.

head in his hands, and close his eyes as if dreaming, then sigh and become limp. He seemed retarded in his thinking, insight and judgment were poor, but this does not imply that his intelligence was impaired. In December 1932 he was agitated and confused. From this time on for several years he had frequent intestinal upsets and diarrhea. In 1933 he became inaccessible and uncommunicative. He formed the habit of standing motionless much of the time and would lean over the table and read a newspaper extensively, always standing. In March 1934 he would pace the floor con-

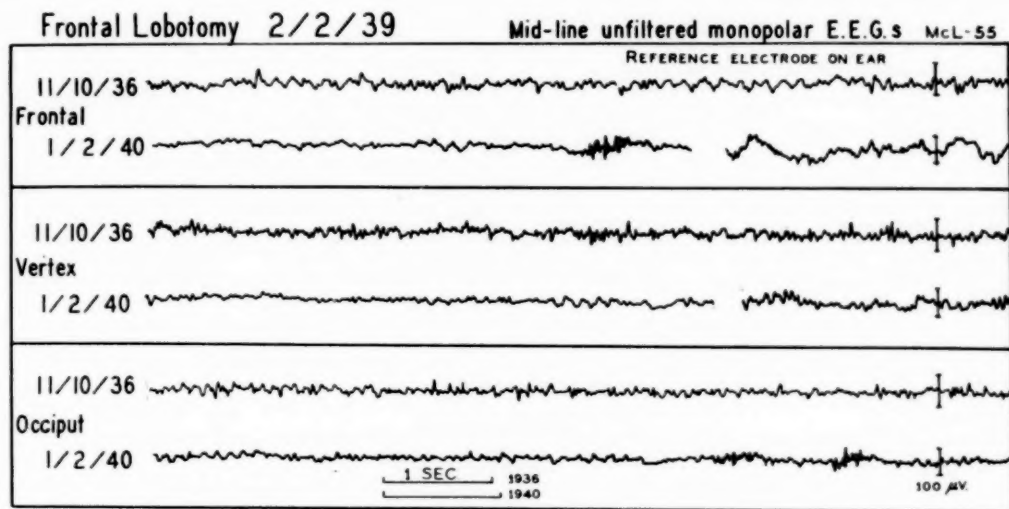


FIG. 3. Comparison of EEG's of McL-55 taken two and one-quarter years before and eleven months after operation. Note absence of high-voltage interference and similarity of fundamental patterns.

In July 1932 he became excited and violent, and screamed until he was exhausted. His periods of screaming lasted from 10 minutes to half an hour. After four days of such behavior he improved. Whether this behavior was influenced by the blow on the crown of his head or not is a possibility which cannot be entirely disregarded.

In November 1932, progress notes describe his speech and posture as that of a depressed person, full of anxiety and perplexed. He was hesitant at times, his speech was slow and deliberate, and he sighed frequently. Periodically he would slump back in his chair as if greatly fatigued. The patient attributed his occasional hesitancy in speech to what he called a "hazy" mind. He would be mute for a period, hold his

continuously, feeling various parts of his body and repeating again and again, "Strange, strange." On April 16, 1934, it was first recorded in the hospital notes that he began to smack his lips in noisy fashion for six to eight hours a day. The patient was asked why he did this and replied that he did not know. He said he was unable to control it. His talking from then on became stereotyped. In February 1935 he developed the habit of wringing his hands. In June 1935 he walked up and down, making peculiar grasping and stroking movements with his hands as if washing them. He paced back and forth in the yard with a book, appearing to read as he walked. During an agitated period of several weeks, he spoke a jargon, but this type of speech later sub-

sided. In December 1935 he again broke into a meaningless jargon, a strange language which he said he himself did not understand and which continued from then on. In November 1936, at the time of the first EEG, he said that he could control his speech only when lying down. At night, however, he was quiet.

This clinical history taken from the daily records of McLean Hospital shows that

encephalographic studies were made in 1938 the patient presented, as he entered the laboratory, a marked exaggeration of all of his earlier behavior manifestations. At this time his behavior was uncontrolled during the recording. He smacked his lips and champed his jaws continuously. There was ample opportunity to identify and prove the

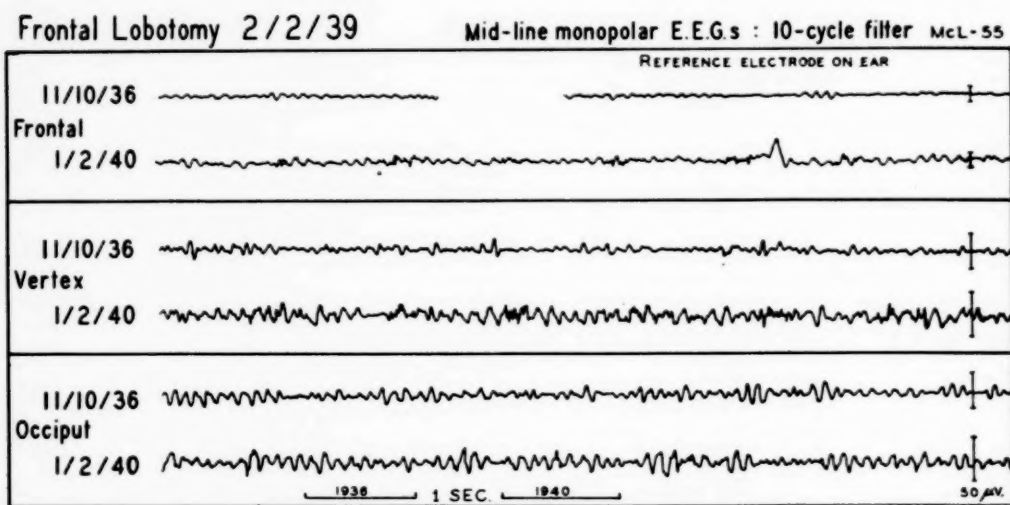


FIG. 4. McL-55. Similar to Fig. 3 except for 10-cycle filter in amplifier circuit, which reduces the amplitude of slow waves and also fast (e.g., muscle) potentials. Calibration is for a sinusoidal alternating current at 10 cycles of 50 μ V. voltage, peak to trough.

stereotypy in behavior and marked episodes of uncontrollable jargon of speech developed rather suddenly after two years in the hospital and although at first intermittent, later became more continuous.

At the time of the first EEG the patient manifested some of his peculiar behavior of wringing his hands and jargon of speech as he came into the laboratory, but he became calm and showed absolutely none of these unusual manifestations while he was being recorded. His EEG was not normal and indicated moderate generalized overactivity (see Fig. 3, lines 1, 3, 5) but there was no indication of abnormal episodes of high voltage such as appeared later in the EEG's of 1938.

When the second and third electro-

source of certain artefacts which these movements put into the EEG. Electrodes were placed on the sides of his jaws in order to time the jaw movements and to determine their influence on the brain record. It was found that although the jaw movements were often synchronous with 4-per-sec. waves which appeared either continuously or episodically in the EEG (see Fig. 5, frontal, left precentral, left temporal, right parietal) the movements were not the cause of these 4-per-sec. waves. The evidence is 1) that in simultaneous monopolar recording the 4-per-sec. wave groups frequently appeared in the left and right frontal but not in the precentral area. The focus frequently shifted from one area to another, and

one area might be active while an adjacent area did not show them. 2) Control experiments on normal individuals showed only the fast frequencies of

degree, no 4-per-sec. waves, or any other rhythm corresponding to the rate of champing, appeared in the record. In 1940 there were only muscle poten-

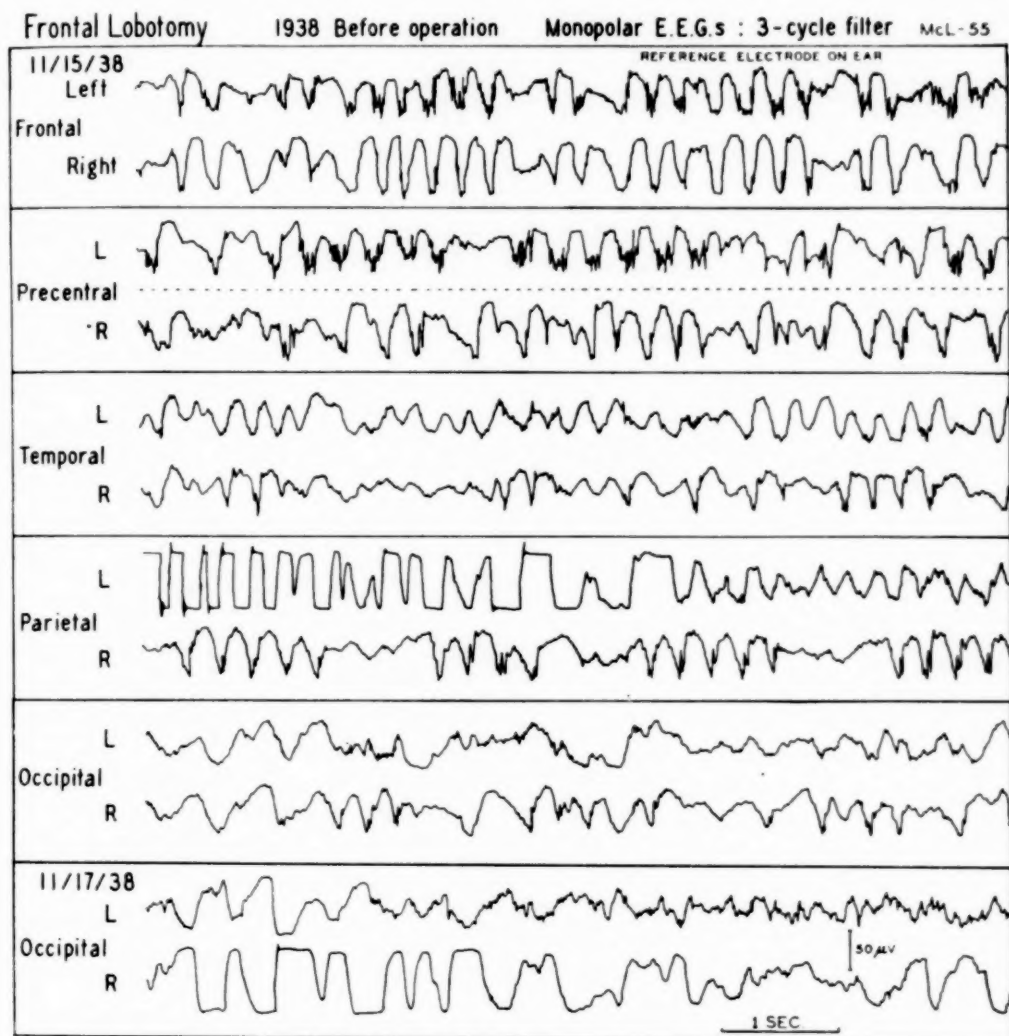


FIG. 5. MCL-55. All records are simultaneous pairs, left and right, except those from precentral area. The 3-cycle filter reduces 10-cycle waves by 50 per cent and muscle potentials by 80 per cent or more. Calibration is for 3-cycle sine wave A.C. Three-cycle filters were used because of powerful interference from muscles of jaws, which were continually active during this record. The flattening of the troughs and peaks of the large waves, in left parietal and right occipital records, is due to overloading of the amplifiers by the high-voltage cortical discharge. The right occipital record shows only partially organized and transient activity. It never becomes "locked" or of as high voltage as seen in the left parietal and left occiput in Fig. 6.

muscle potentials at each movement of the jaws and no 4-per-sec. waves. 3) In this same patient's EEG in 1940, when he occasionally champed his jaws as during the 1938 tests, although to a lesser

degree, no 4-per-sec. waves, or any other rhythm corresponding to the rate of champing, appeared in the record.

In the 1938 records a marked difference in the degree and character of abnormal activity appeared between the

left and right sides of the brain. Although the entire EEG from any lead was highly abnormal, it was a superimposed abnormal activity which did not entirely obscure the normal pattern. In addition to the generalized abnormal activity (see Fig. 5) there appeared from the left side of the head *episodes* of "locked" delta activity of tremendously high voltage [at least 500 μ V.

the amplifiers were overloaded (as in Fig. 5, left parietal), while simultaneously 6-per-sec. waves appeared from the right frontal area. The right side, however, showed a greater persistence of continuous abnormal activity than the left, and often of high voltage (Fig. 5, right occiput).

On November 15 the left side presented higher voltage activity in the

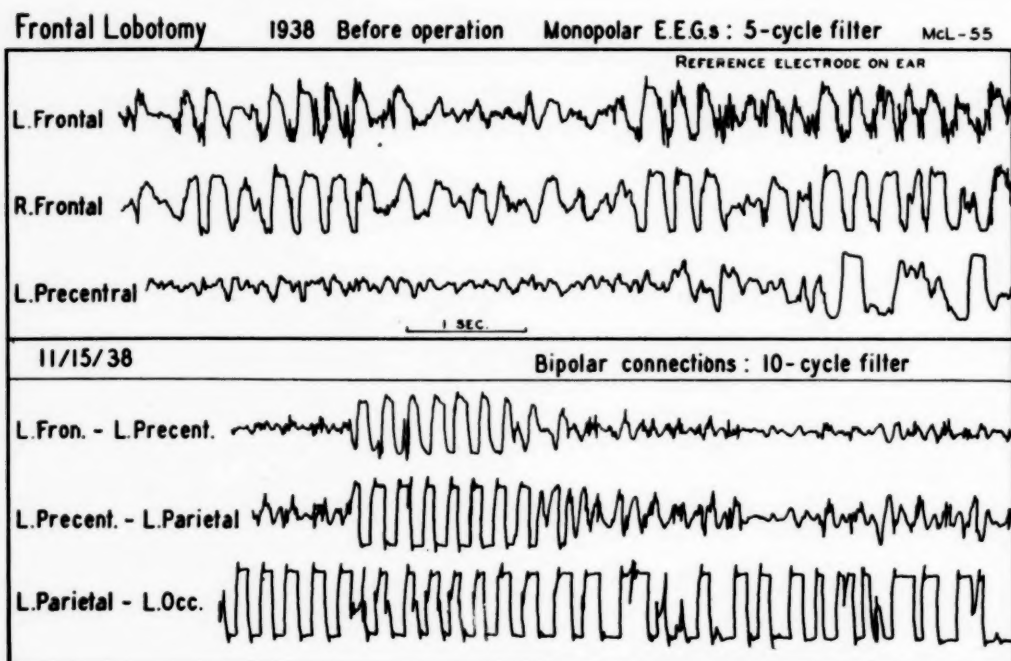


FIG. 6. MCL-55. Simultaneous records, similar to those in Fig. 5, except for the tuning of the filters and the use of bipolar connections.

see Fig. 5, left parietal, and Fig. 6)]. The high-voltage "locked" delta episodes did not appear on the right side of the brain. The high-voltage episodes temporarily obliterated the fundamental pattern and were sharply localized. At one time a 10-per-sec. rhythm was present in the left precentral area simultaneously with a 4-per-sec. rhythm in the left and right frontal areas. At another time the left precentral and again the left parietal areas developed such high-voltage episodes of approximately 3-per-sec. activity that

slow range (highest in occipital, lowest in frontal) than on the 17th. On the 15th the patient was less agitated during the test than on the 17th, when he was tense, overactive and definitely less under control. In this connection it is interesting that many epileptics, [according to Dr. W. G. Lennox (5), and unpublished observations by the author], when kept busy and active and not allowed to relax are less likely to have seizures and associated disturbances in their EEG's. This does not imply that MCL-55 is or ever was epi-

leptic, but the electrical activity of his brain, as in the case of many epileptics, was of high voltage and more abnormal when the patient was relatively quiet on the 15th than on the 17th when he was more agitated. In spite of the abnormal interference and episodes in

of behavior. A pneumoencephalogram taken at about this time revealed a left hemiatrophy of the occipital and of the posterior part of the parietal lobes, corresponding to the regions from which the highest voltage episodes were recorded.

Frontal Lobotomy 1940 After operation Monopolar E.E.G.s : 3-cycle filter McL-55

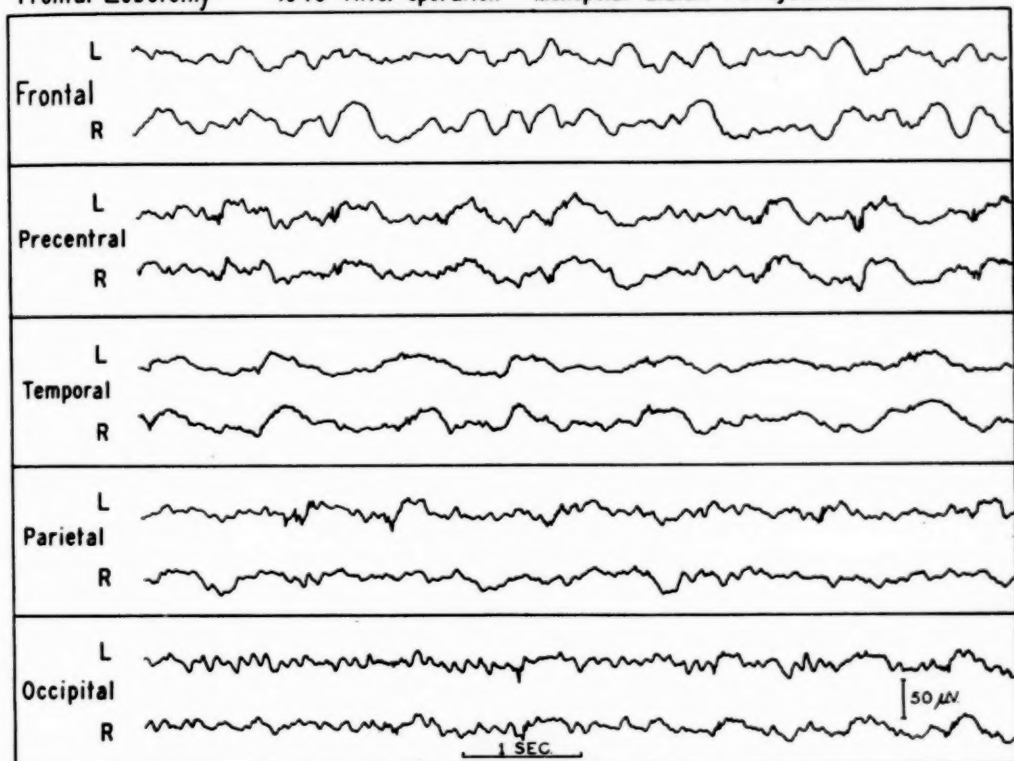


FIG. 7. McL-55. Placements, sensitivity, and tuning of filters are similar to these employed for Fig. 5. Jaw movements, far less vigorous than before, sometimes appeared, as indicated by the small groups of muscle potentials.

1938, the fundamental pattern when it could be observed was the same as in 1936. It showed a normal 10-cycle alpha activity which speeded up as usual after the eyes had been closed and was fairly regular and sinusoidal in wave shape. The alpha rhythm had not changed either in voltage or rate, nor were the waves deformed when abnormal interference was absent. The superimposed abnormal electrical activity appeared in 1938 concomitantly with the extraordinary manifestations

On February 2, 1939, Dr. W. Jason Mixer performed a bilateral frontal lobotomy similar to the operation used by Freeman and Watts (4). Dr. Mixer states that "drill holes were placed in the bone about 3 cm. posterior to the edge of the orbit and the frontal lobes sectioned on each side by sweeping a blunt edge spatula upward and downward in the white matter." The frontal cortex was thus undercut.

On March 20, 1939, approximately 7 weeks after the lobotomy, the patient

returned voluntarily to the electroencephalographic laboratory. The thin, nervous man with a shuffling gait, jaws champing, a continuous high-speed gabble of speech who had come in before operation now presented himself as one who had put on weight, had excellent color, genial manner and was perfectly

give no 4-per-sec. wave groups or any of the high-voltage episodes seen in November 1938. Very slow waves of moderate voltage were present, particularly in the frontal area, but if this record were studied in isolation the abnormal features would not be considered of very profound significance.

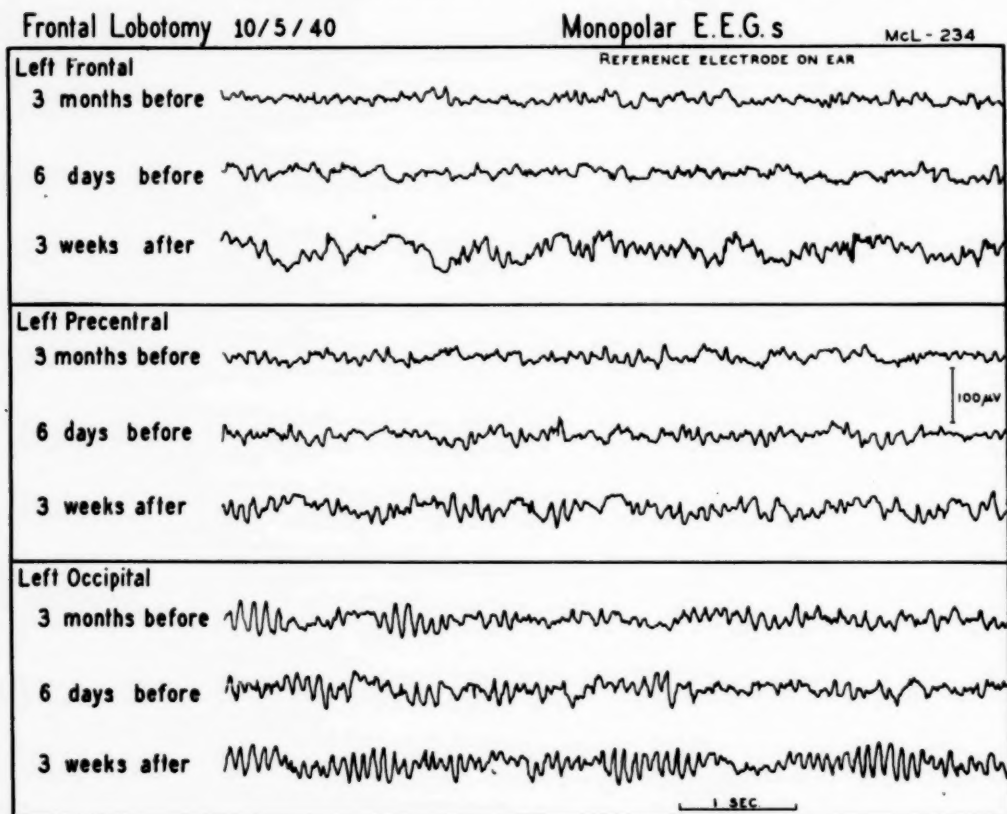


FIG. 8. Comparison of EEG's of MCL-234 taken three months before, six days before, and three weeks after operation. Note that the amplification is about 40 per cent greater than that used in Figs. 1 and 3. It is the same as in Fig. 2.

charming and delighted to cooperate with the hospital in having another EEG taken. Traces of his previous behavior could be detected by careful observation, but it was so reduced as to be practically negligible. In the EEG taken at this time the superimposed abnormal activity which had previously given evidence of profound and continuous physiological disturbance had been so reduced and disorganized as to

The final EEG taken eleven months post-operatively revealed no significant difference from the record taken on March 20, 1939. The very slow waves are still present (see Fig. 7), but the fundamental pattern closely resembles that seen in the first test in 1930 (see Figs. 3 and 4).

The third case (MCL-234) presents also a picture of agitation. The complaint on admission was of depression with loss of

inter-
depre-
healt-
his
work-
adm-
apop-
post-
in th-
hand-
reco-
not l-
a pe-
He l-
could-
atten-
eat,
had

D
in t-
X-ra-
sinu-
hosp-
thro-
and
pan-
an c-
The
W
labo-
whic-
prof-
arm-
men-
and
shal-
whic-
also
simi-

T
bot-
from
The
volt-
wav-
pat-
hyp-
shal-
tien-
EE

interest. He had had no previous periods of depression, and his history was one of good health, habits and family relationships with his children, and excellent capacity for his work in business. Two years previous to his admission to McLean he apparently had apoplexy, which temporarily affected his postural reflexes and caused a numbness in the left leg and middle finger of the left hand. He was kept in bed for six weeks and recovered. The onset of his agitation could not be dated precisely, but developed over a period of several months after his shock. He became apprehensive, restless, said he could not swallow, cried often, and finally, after becoming unable to sleep, refusing to eat, and extremely agitated and tense, he had to be hospitalized.

During the one year and four months in the hospital, he remained agitated. X-rays of the skull taken because of sinus trouble, which developed in the hospital, revealed a hazy density throughout the right antrum, ethmoids and frontal regions. A diagnosis of right pan-sinusitis with pus was made, and an operation was performed (3/30/40). The patient made a good recovery.

When the patient came into the EEG laboratory, he answered questions in whispers and was agitated. He had a profound tremor of his right hand and arm and was retarded in his movements. He was quite atonic muscularly, and had poor color. His respiration was shallow, at a rate of 48 to 56 per minute while lying down for half an hour. He also had slight chewing movements similar to McL-55.

Three EEG records taken before lobotomy revealed no differences one from another over a four-month period. They revealed an instability, with low-voltage fast waves, as well as slow waves, threading through the alpha pattern (Fig. 8). From our studies in hyperventilation, we believe that the shallow, rapid respiration of this patient did not significantly affect his EEG.

Three weeks following his lobotomy operation there appeared to be greater instability in the precentral and frontal regions, but a definitely greater stability and less fast-frequency interference in the occipital region (Fig. 8). When being recorded post-operatively, he occasionally showed a resumption of his shallow respiratory rate of 48-56 per minute.

The post-operative history of this patient to date (Dec. 1940) is that he is out of the hospital, very active, sociable, more self-confident, and enjoying life more than he has for years. He has gained weight, is independent and apparently quite well.

In this patient's EEG and behavior the results of the lobotomy are quite similar to those in the case of McL-27. In both cases, agitation was definitely relieved by the operation, enabling the patients to return to life outside the hospital and to greater health and happiness.

DISCUSSION

The striking improvement in the EEG of McL-55 appears to be associated with an equally striking improvement in his clinical behavior. In the first case (McL-27) there was little if any immediate change in the clinical behavior and only very slight modification of his EEG. In each case, furthermore, the fundamental EEG patterns were preserved following lobotomy. The rate, voltages, and frequencies of the fundamental patterns were not altered, and likewise the fundamental characteristic personalities of the two patients, though as different from each other as their characteristic EEG patterns, likewise remained unchanged. Only a slight retardation in intellectual alertness was observed.

All three patients had shown agitated behavior, but no symptoms of deterioration. All of them had shown ster-

eotyped behavior and had gone about wringing or picking their hands. One of them (McL-55) after two years in the hospital developed a jargon of speech and motor restlessness to a particularly marked degree. His clinical picture was highly exaggerated in quality in comparison with the other two patients. The EEG pattern of this patient showed a more pronounced and sharply

connections between frontal lobe and subcortical structures were severed and also some or all of the intercortical connections to and from the frontal areas (see Fig. 9). It appears that both the electrical and motor overactivity diminished as a result. This does not imply that the frontal area was the focus or pace-maker for the abnormal cortical activity and, indeed, the prominence

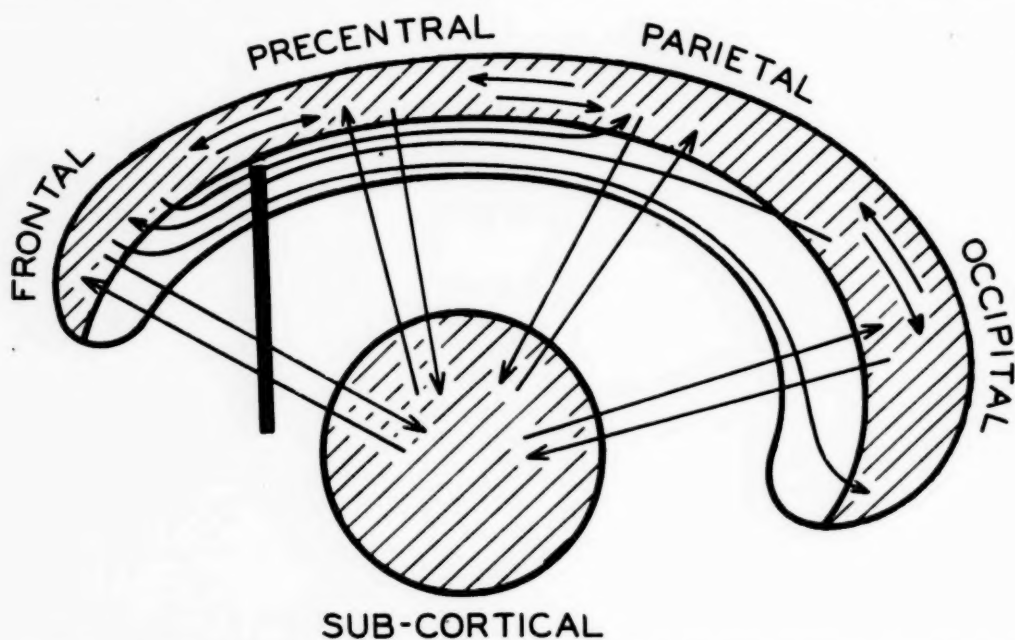


FIG. 9. Schematic diagram of connections of frontal areas severed by prefrontal lobotomy. The subcortical connections and many or all of the long cortico-cortical association pathways were presumably severed. Most or all of the short association pathways and intracortical connections presumably remained intact.

localized abnormal activity on the left side than on the right. It is an interesting question whether such an overactivity might account for the characteristic pacing, hand-washing, stereotypy, continuous jargon of speech and champing of jaws. In any case, the physiological overactivity disappeared almost completely following the lobotomy. The frontal cortex has intercortical association pathways and also direct intracortical connections to other parts of the brain, and all regions have connections with subcortical structures beneath. In the frontal lobotomy the

of high-voltage episodes in the left parietal and occipital regions suggests that they, or the subcortical centers connected with them, were the primary source and focus of the disturbance. The improvement following the lobotomy may be explained by assuming that the frontal lobes previously received and transmitted impulses through the intercortical association pathways or by way of subcortical centers that facilitated and augmented the electrical activity of other regions of the cortex. When the impulses to and from the frontal lobes were eliminated or di-

minished, the level of cortical activity of the region responsible for the abnormal patterns and outbursts was reduced and the abnormal electrical activity no longer appeared. Perhaps a vicious cycle of cortical overactivity reverberating between frontal and other areas was broken.

A clue to the particular region of the brain which may have been responsible for the repetitive speech, which was such a prominent symptom in McL-55, may be found in a recent paper by Brickner (1). Brickner describes a patient whose brain was explored at operation with a pair of stimulating electrodes. When a particular area about 1 cm. in diameter on the mesial surface of the left hemisphere, low in area 6, was stimulated, the patient responded with repetitive speech in a stereotyped manner. The patient was fully aware of the continuous repetition during stimulation, but was unable to check herself. After this area had been excised to a depth of 0.2 cm., stimulation of the exposed white matter and cortical edges failed to elicit the phenomenon. In McL-55 we might assume that the disturbance involved the same left-sided area described in Brickner's report. In Brickner's patient a small area of cortex was excised. In McL-55 we may suppose that its activity was reduced by cutting off the impulses previously reaching it from the frontal lobes. This is at least a possible explanation of the disturbance and its improvement.

Whether or not the above neurological hypotheses are tenable, it is clear that the lobotomy in the patients (McL-27 and McL-234) gave no great immediate improvement nor did it make their condition worse. McL-55 differed from McL-27 and McL-234 in that he was suffering from a generalized and profound electrical disturbance of the entire brain involving a localized intermittent disturbance about a restricted

region of the left side of the head. The effect of the lobotomy performed on McL-55 by cutting tracts subcortically was to relieve the patient of profound uncontrollable cortical overactivity and to allow him to assume his former characteristic self-controlled behavior.

Another series of electroencephalographic studies has been made on patients who have been treated by either insulin (unpublished) or metrazol therapy [Davis and Sulzbach, (3)]. In all of the follow-up studies of these patients there is clear evidence of damage to the brain. The lobotomy in the three patients reported here appears to have left the cortical activity of the brain more normal than in the patients who had undergone shock therapy.

Drs. Stanley Cobb and Jason Mixter regard the results in these cases as indicative of a good lead and possible justification for lobotomy in older and agitated patients who reveal profound and long-standing physiological overactivity of the brain which cannot be brought under control by any other means. Though nerve cells in the brain are destroyed when their fiber connections are severed as in a lobotomy operation, the extent of the damage is known to be restricted.

SUMMARY

Electroencephalograms (EEG's) were recorded on three mental patients at McLean Hospital before and after bilateral frontal lobotomy. The operation was performed in each case for the relief of agitated depression. The EEG's of the patients (McL-27 and 234) before operation showed relatively little differentiation in the activity of different cortical areas (Figs. 1, 2 and 8). There was no asymmetry between left and right sides and no evidence of any unusual degree of cortical overactivity (Figs. 1, 2 and 8). The patients' behavior immediately following their op-

erations was not fundamentally changed. A few weeks later their agitation had disappeared almost completely, enabling them to leave the hospital. Except for an increase in instability, there was no significant change in their EEG's even in the frontal area which had been undercut (Figs. 2 and 8).

The EEG of the second patient (McL-55) showed a mild generalized overactivity in 1936 (Figs. 3 and 4), which in 1938 was greatly exaggerated, distorted and more continuous (Fig. 5). In 1938 there were also specific episodes of "locked" delta activity (Fig. 6) of very high voltage appearing only on the left side of the head and predominantly in the left occipital and parietal areas. At this time he was suffering from excessive uncontrollable motor activity and a continuous jargon of speech. A pneumoencephalogram revealed a left cerebral hemiatrophy, largely in the occipital and the posterior part of the parietal lobes. The abnormalities of behavior were almost completely relieved by the operation. Likewise the superimposed abnormalities in the EEG were greatly reduced and the record was entirely free of high-voltage episodic ac-

tivity (Figs. 3 and 7). The improvement in the EEG corresponds perfectly to the improvement in his behavior, and a follow-up record taken eleven months post-operatively showed no further change in the pattern.

After operation in both cases the fundamental characteristic alpha frequencies, voltages, wave shapes (and response of the alpha rhythm to opening and closing the eyes) were practically the same as observed in their earliest records.

BIBLIOGRAPHY

1. BRICKNER, R. M.: A human cortical area producing repetitive phenomena when stimulated. *J. Neurophysiol.*, 3: 128-130, 1940.
2. DAVIS, P. A.: Technique and evaluation of the electroencephalogram. *J. Neurophysiol.* 4: 92-114, 1941.
3. DAVIS, P. A., and SULZBACH, W.: Changes in the electroencephalogram during metrazol therapy. *Arch Neurol. Psychiat.*, 43: 341-353, 1940.
4. FREEMAN, W., and WATTS, J. W.: Subcortical prefrontal lobotomy in the treatment of certain psychoses. *Med. Ann. District Columbia*, 6: 1-4, 1937.
5. LENNOX, W. G., GIBBS, F. A., and GIBBS, E. L.: Effect on the electroencephalogram of drugs and conditions which influence seizures. *Arch. Neurol. Psychiat.*, 36: 1236-1245, 1936.
6. MIXTER, W. J., TILLOTSON, K. J., and WIES, D.: Reports of partial frontal lobectomy and frontal lobotomy performed on three patients: one chronic epileptic and two cases of chronic agitated depression. *Psychosom. Med.*, 3: 3-14, 1941.

A STUDY OF STRUCTURAL AND INSTINCTUAL CONFLICTS IN CASES OF HAY FEVER*

GEORGE W. WILSON, M.D.**

IT IS REASONABLE to believe that man's assumption of the upright position was the beginning of greater utilization of the visual and auditory sensibilities and a lessening of olfactory perceptions. This produced a corresponding increase in the visual and auditory acuity, accompanied by a diminution in olfactory sensitivity. It is a well established fact that primitive vertebrates rely primarily upon olfactory perception for the maintenance of existence and as the stimulus for reproduction.¹ Danger, food and sexual stimulation are all perceived by the olfactory centers before perception takes place in either the optical or auditory spheres. Grinker (6) in a personal communication states: "The importance of primitive olfaction as the first receptor of distant stimuli

is further enhanced because it gave rise to the evolutionary trend from which the neo-cortex arose. Danger perceived from considerable distance permitted a slower and more adaptive response, which characterizes cortical activity, than stereotyped immediate reflex activity of lower levels of the neuraxis. As olfaction became less important in the primates and least in man, the large olfactory areas of the cortex, the massive subcortical system of connections and the olfactory portion of the diencephalon became more concerned with central regulation and adaptation of visceromotor activity and the visceral expressions of certain emotions. Chief among these is the regulation of flight or fight reactions or the expressions of fear or anger. The preparedness of activity in these spheres constituting a tonic activity of old olfactory diencephalic centers finds expression in the universal state of anxiety, normally conditioned into appropriate and preservative fear of dangers in reality, morbidly internalized in neuroses. Thus, centers concerned with responses to dangers perceived through the sense of smell became concerned with preparedness and emergency responses to dangers perceived by all the sense organs and from inner instinctual drives provocative of dangerous retaliatory reactions from the environment."

Observations on children demonstrate a greater sensitivity to odors than that possessed by adults. It is also observed that children are less or not

* Read before the Chicago Psychoanalytic Society, Chicago, Oct. 4, 1940.

A contribution to the research program of the Chicago Institute for Psychoanalysis.

The term structural conflict is used in the sense of Alexander's formulation in his paper "The Relation of Structural and Instinctual Conflicts," *Psychoanalyt. Quart.*, 2: 181, 1933.

** Chicago, Illinois.

¹ In a footnote in his book "Civilization and Its Discontents," Freud writes: "The diminution in importance of olfactory stimuli seems itself, however, to be a consequence of man's erecting himself from the earth, of his adoption of an upright gait, which made his genitals, that before had been covered, visible and in need of protection and so evoked feelings of shame. Man's erect posture, therefore, would represent the beginning of the momentous process of cultural evolution. The chain of development would run from this onward, through the diminution in the importance of olfactory stimuli and the isolation of women at their periods to a time when visual stimuli became paramount, the genitals became visible, further till sexual excitation became constant and the family was founded, and so to the threshold of human culture."

at all disturbed by what to the adult constitutes a disagreeable or disgusting odor. The offensive reaction to odors *must* be a conditioned and not an instinctive one. Young children as well as animals will often eat their own vomitus and smear their feces. This condition also occurs frequently in states of regressive psychosis. Olfactory hallucinations are very common, particularly in paranoid states. The offensive reaction to odors takes place during the child's early development and *must* be a product of the environment and an identification with the attitude of the parents toward odors.² Exactly this attitude of parental figures toward dirt, filth, offensive or disgusting smells together with similar attitudes toward other biological functions may well have a far-reaching influence upon the child's psychological development.

The present report represents a psychoanalytic study of seven cases of hay fever (five female and two male patients). The material presented by these patients during psychoanalysis led me to the assumption that the psychological component of the hay fever symptom is a result of unsuccessful olfactory repression. Probably the first and most important factor in determining this unsatisfactory repression is that of unsatisfied, thwarted and inhibited sexual curiosity. The failure or refusal of parental figures to enlighten and instruct the child who is attempting to satisfy

and master his sexual curiosity leads to a displacement and an increase in preoccupation with other bodily functions—particularly elimination. This function is intimately associated with odors: breath, perspiration, urine and feces. When parents and other persons in authority place a strict taboo upon the sexual curiosity, while at the same time they encourage and even seduce the child into preoccupation with the excretory functions, this displacement readily, and probably with varying degrees of intensity, inevitably occurs.³

All of my patients remembered being exposed, during childhood, to many experiences of seductive behavior by one or both parents, often under the guise of interest in their excretory functions. For example: The two boys were given inadequate and even false sexual information; one was given enemas by his mother up to the age of five and the other two up to the age of twelve. Of the girls studied, all five were often attended by their fathers before and after performance of the excretory functions up to—and in one case after—puberty. None of these girls were given adequate or honest sexual information. The mothers were all sexually inhibited women, who had themselves been reared and brought up according to strict, mid-Victorian patterns including a strict taboo of anything sexual. The fathers of all the patients studied maintained complete aloofness to their children's curiosity along sexual lines. It is not my intention to infer that children reared in such an environment are predestined to have hay fever. The parent-child relationship that I have indicated

² In "Civilization and Its Discontents," Freud continues: "Excreta arouse no aversion in children; they seem precious to them, as being parts of their own bodies which have been detached from them. The training of children is very energetic in this particular; its object is to expedite the development that lies ahead of them, according to which the excreta are to become worthless, disgusting, horrible and despicable to them. Such a reversal of values would be almost impossible to bring about, were it not that these substances expelled from the body are destined by their strong odors to share the fate that overtook the olfactory stimuli after man had erected himself from the ground."

³ This preoccupation with organic functioning by one or more parental figures during the child's developmental processes may have a far-reaching influence in determining later reaction patterns, particularly with regard to the individual's attitudes toward his or her own body and doubtless influences or may determine the choice of neurotic symptom or even the site of involvement in organ neuroses.

is fairly common, both for children who develop other types of neuroses as well as for children who make fairly satisfactory psychological adjustments. It is rather my intention to demonstrate that these patients were reared in an atmosphere that was conducive to the repression of sexual curiosity and at the same time encouraged in the indulgence of olfactory perception.

Krafft-Ebing (8) in "Psychopathia Sexualis" states: "In beasts, the influence of olfactory perception on the sexual sense is unmistakable. Extirpation of the olfactory nerve in puppies renders the male unable to recognize the female." Mantegazza removed the eyes of rabbits and found that this deficit did not in any way interfere with procreation. Some writers claim that the habit of kissing originates in the sense of smell rather than that of taste. This would explain the ritual of nose rubbing as a form of greeting in Western cultures. Fliess demonstrated the so-called genital spots in the noses of women, which when anesthetized with cocaine controlled painful menstruation. Brill (2) in a most interesting article, "The Sense of Smell in the Neuroses and Psychoses," discusses the relation between preoccupation with pleasant and unpleasant odors in the neuroses and psychoses and agrees with Daly (3) who claims: "The hyper-sexual attractive smell given off by the female in heat must have been one of man's greatest temptations to violate the incest taboo." Daly, however, is of the opinion that the sex-attractive odor is lost to mankind. My own experience agrees with that of Brill when he states: "I am convinced that although very deeply repressed, it is still quite active and occasionally comes to the surface." Dunbar (4) in her paper "Psychoanalytic Notes Relating to Syndromes of Asthma and Hay Fever" says she observed that her asthma and hay fever

cases were much preoccupied with their sense of smell.

Magnus Hirschfield (7) in his book "Sexual Pathology" makes an exhaustive—but from a psychological viewpoint quite superficial—study of perversions, and writes: "The eye is especially the medium of human love. Possibly because through its use in the erotic realm, the involuntary seeking and pursuing of sexual stimuli, it has become for us the chief receptive station for beauty. With other creatures, other senses take this leading position, and always, with every animal, his most delicate organ is also erotically the most sensitive perceptive organ. . . . In the animal world, attraction through scent plays a large rôle, and elsewhere the sense of smell is highly developed. A great many animals have glandular organs whose secretion is solely for the purpose of attracting the male. The male will follow the scent of this perfume . . . for unbelievable distances; . . . Many animals become absolutely intoxicated through smelling so that finally . . . there is scarcely time for the sexual act. . . . As regards the sense of smell, I could cite a number of cases in which this sense dominated over the others. . . . Many people say that any and every perceptible body odor emitted by a person whom they love is unpleasant to them. . . . It is evident that even unsympathetic impressions, in the case of strong love, can awaken feelings of desire which, to be sure, usually have a masochistic basis. Thus I know of a case in which a girl was violently in love with an athlete, who suffered from a foul-smelling ozena. In the beginning this obnoxious odor was exceedingly painful to her, but her passion was so strong that not only did she become accustomed to it, but even missed and sought for it. In another case the pungent reek of a cavalryman's sweating feet caused a strong revulsion in a lady

of high standing, and later a feeling of the strongest desire. . . . From the observations of Schiff, Fliess and others, it may be concluded that there are certain sexual points in the erectile tissues of the nose which are in correlation with the proceedings of the sexual sphere. From this arises the probability that there are erogenous zones in the nasal mucous membrane such as we have long known to exist in the sensory sphere of the skin."

In a further discussion of *head fetishism*, Hirschfield quotes from the material of a case of hair fetishism as follows: "If he buried his face in the hair which attracted him, an ejaculation often resulted immediately."

In another case of hair fetishism he says: "S. himself describes the phenomenon of his aberration: 'After I have cut the lock, I go home and kiss the charming hair again and again, I press it to my nose and cheeks, and breathe in the previous fragrance of it.'"

Freud (5) in his paper "A Case of Obsessional Neurosis" states: "By his own account, when a child, he recognized every one by their smell, like a dog, and even when he was grown up he was more susceptible to sensations of smell than other people . . . and I have come to recognize that a tendency toward osphresiolagnia which has become extinct since childhood may play a part in the genesis of neuroses." In a footnote, Freud refers particularly to certain forms of fetishism as a result of olfactory repression. In "Three Contributions to the Theory of Sex," Freud states: "Psychoanalysis has filled up the gaps in understanding of fetishism by showing that the selection of the fetish depends upon a coprophilic smell-desire which has been lost by repression. Feet and hair are strong smelling objects which are raised to a fetish after the renouncing of the now unpleasant sensation of smell." Freud

then goes on to explain the further over-determination of the feet and hair as displacements above and below for the absence of the penis in women. Abraham (1) in a discussion of a case of foot and corset fetishism says: "In the present case of fetishism I found the patient's pleasure in 'disgusting' body odors had been unusually strong originally." Abraham's patient had passed through a stage of what would correspond to smell-fetishism and a moderation took place that led to repression of the olfactory sensitivity with a substitution of interest and pleasure in looking, *i.e.*, the interest in odors had been repressed and visual curiosity substituted with displacement to another part of the body that gave off an odor.

In other words, Freud and Abraham came to the conclusion that the repression of eroticized olfactory sensation resulted in displacement to the visual field but with a secondary displacement from the genitals to the feet or to the hair. Freud called this phenomenon "partial repression and displacement."

A study of the material collected during psychoanalysis of seven cases convinced me that the psychological component in hay fever is based upon a displacement of sexual curiosity from the visual to the olfactory sphere. This would explain the preoccupation with an anal interest in organs capable of secreting odorous substances and symbols for organs that may represent anal (olfactory) substitutes for the genitals. Displacement of interest from the genitals to other organs may also explain in many cases a similar over-evaluation of a non-genital organ as observed in fetishism.

Noting this strong tendency toward anal (olfactory) displacement led me to make definite inquiries regarding sensitivity to odors in each of my patients. (On several occasions patients had in-

formed me that their olfactory sensitivity was particularly acute during states of emotional tension, and that certain odors precipitated hay fever attacks, but the relatively extreme acuity of olfactory perception only came to light when I made specific inquiries.)

Before presenting case material to demonstrate my thesis, I should like to refer briefly to certain patterns of similarity in all of the hay fever patients studied.

CASE 1

This patient was a 26-year-old unmarried male who suffered from mild seasonal hay fever. He presented no other organic symptoms. He had had severe constipation as a child. This patient came for treatment because of a severe obsessional neurosis, with the predominant symptom of compulsive thinking.

Sexual Information: He was given inadequate and false information by the mother; no information by the father.

Seduction Experience: Enemas were given him by the mother up to the age of twelve, and on at least one occasion he gave an enema to his mother. He slept in the same bed with his mother until the age of fourteen.

Sensitivity to Odors: This man was extremely sensitive to unpleasant odors, particularly the decaying of nitrogenous material. During analysis he occasionally hallucinated unpleasant odors in the room.

Tendency toward Displacement of Interest: Women with red hair had always been extremely attractive to this man, (9).

CASE 2

This patient was a 23-year-old unmarried male who suffered from severe attacks of seasonal asthma and hay fever. He presented no other organic difficulties, but sought treatment for relief of his upper respiratory symptoms.

Sexual Information: He was never given any sexual information or instruction by either parent. The mother and father were divorced when the patient was 18 months of age. When the patient was three years of

age he was kidnapped and cared for by the father for a period of about two months. The patient's mother remarried when the patient was about five; the stepfather never discussed anything of a personal or sexual nature with him. The patient's grandmother, who lived in the home, gave the patient false, threatening information (she threatened him with drowning to discourage masturbation and bed wetting).

Seduction Experience: At the age of five he was seduced into sexual play with a girl of twelve. This play continued over a period of several months but was never confessed to any one. At the age of six, he was introduced to mutual masturbation by a boy of twelve. Both the mother and the grandmother displayed an exaggerated interest in the patient's excretory functions, and give him cathartics and frequent enemas.

Mother's Pregnancy: A sister was born when he was eight years of age. The sister's impending birth was never discussed with the patient, and his hay fever developed during the mother's pregnancy.

Sensitivity to Odors: He was extremely fond of the smell of caves and underground passages. He spent his vacation periods exploring underground places.

Tendency toward Displacement of Interest: This boy displayed an early obsession to learn to play wind instruments, and later expanded this to an intense need to master all of the common musical instruments.

CASE 3

This patient was a 26-year-old unmarried female who suffered from severe seasonal hay fever for which she sought treatment.

Sexual Information: She was given inadequate and false information by both her mother and a grandmother who lived in the home. The mother probably lied to the patient regarding her own sexual life, claiming that her only reason for marrying was because she wanted children. The mother's attitude toward having children after the patient's birth was proof to the patient that this assertion was untrue. Both parents and the family physician exhibited an exaggerated interest in her eliminatory functions.

Seduction Experience: At the age of five, on the promise of being given a present, she was seduced into introducing her hand into the pocket of a strange man. She felt the man's erect penis and ran home frightened, but did not report this experience for several hours. At the age of seven she had a similar experience with the janitor in the building where she lived. This experience she never confessed prior to her analysis.

Mother's Pregnancy: Although material reported during the analysis would indicate that the mother had at least one abortion after the patient's birth, this has been consistently denied and cannot be proven.

Sensitivity to Odors: This girl claimed that she had always been extremely sensitive to odors of both an unpleasant and pleasant nature. As a young child she classified her parents and grandparents according to their "smell." She complained that her mother was very careless about laundering her lingerie and about personal cleanliness. Although she was extremely fond of her grandfather, she claimed that his breath was offensive to her. As an adult, she claimed that she could detect at a distance the odor of a menstruating woman. She also said she could detect a change in odor of a man when he became sexually excited.

Tendency toward Displacement of Interest: This patient expressed what amounted to a fixed delusion that her feet were exceptionally large, and that this marred her otherwise beautiful figure. She also exhibited considerable interest in her own hair, and once remarked that although she felt nervous and tense, she would feel relaxed as soon as she had been to the hairdresser. She was also extremely attracted to red-headed men.

Case 3 will be referred to in considerable detail later in this presentation.

CASE 4

This patient was a 35-year-old single female. She suffered from severe seasonal hay fever, nonseasonal asthma and spastic colitis. She sought treatment because of the colitis. The hay fever and asthma were not admitted until after her analysis began.

Sexual Information: This patient received

inadequate sexual information, probably without any falsification, from the mother. An attitude of complete aloofness was maintained by the father. The mother, grandmother and several doctors, who were consulted because of frequent illnesses during the patient's childhood, expressed an exaggerated interest in her eliminatory functions. She was given cathartics and enemas regularly.

Seduction Experience: The father and a maternal uncle were extremely seductive toward the patient when she was a child, and became very inhibited in their behavior when she reached puberty. The patient occupied a berth with her father on a trip to Florida when she was five years of age. Upon their arrival in Florida, she became quite interested in a bellboy at the hotel where they stayed. A seductive gesture, for which she was severely punished, was the placing of her hand upon her genitals and then putting her fingers up to the bellboy's nose with the remark: "Smell beautiful perfume." When the patient was six, she developed some sort of a vaginal infection, and it was recommended that the mother use frequent douches as a treatment. The analysis revealed that the patient utilized this treatment for the purpose of being masturbated by the mother for a long period of time. This behavior pattern was later repeated as an adult with several doctors.

Mother's Pregnancy: A sister was born when the patient was four, and the mother had a miscarriage of twin boys when the patient was seven. The patient was not informed about either pregnancy but was told of the miscarriage after it occurred.

Sensitivity to Odors: She did not exhibit an extreme sensitivity to odors, but occasionally hallucinated disagreeable and sexually stimulating odors. During adolescence she developed nasal polyps which were surgically removed, and this procedure was repeated many times.

Tendency toward Displacement of Interest: This patient reported a large number of dreams in which shoes and hats were used as genital symbols. She made an extensive study of the history and development of head coverings, became an instructor, and

later the head of a large millinery establishment.

CASE 5

Patient F. was a 30-year-old married female. She suffered from severe seasonal hay fever. She sought treatment because of neurasthenia, with the predominant symptom of cardiac palpitation.

Sexual Information: She was given inadequate and false sexual information from the mother, grandmother and the housekeeper. The patient was overprotected outside the home, but the mother relegated much of her home training to a housekeeper.

Seduction Experience: This housekeeper seduced the patient into mutual masturbation when the patient was seven. At the same time she also initiated mutual masturbation between the patient and her younger brother. The father was overly affectionate when the patient was a child, but extremely inhibited with her as she approached maturity.

Mother's Pregnancy: The patient had two younger brothers, one born when she was five, and another when she was eight years of age. She was not given any preparation or information relative to either pregnancy.

Sensitivity to Odors: This patient was extremely sensitive to both pleasant and unpleasant odors.

Tendency toward Displacement of Interest: Hairy men were very repulsive to this woman. She experienced a feeling of disgust in relation to people who were careless about bodily cleanliness. She married a man whom she knew was extremely careless in this respect, and she obtained great satisfaction in trying to reform him.

This detailed account of rather striking similarities in parental attitudes toward sexuality as well as the reaction formations which seemed to parallel each other to a considerable extent in all of my cases has been presented, not because of the belief that all such environments lead to hay fever, but because this parallelism may be of some significance in the apparently unsuc-

cessful attempts at repression of olfactory stimulations.

I should like to present a fragment from the analysis of Case 4 of this series, and from this material to demonstrate the major part of a psychological cycle beginning with inhibited or forbidden sexual curiosity that is followed by an unsuccessful attempt at intellectual sublimation through substitution of the object and attempts at displacement from the olfactory to the visual sphere. With the failure of sublimation and substitution in *both* spheres, and the threatened emergence into consciousness of the repressed curiosity which was so intimately connected with feared sexual impulses, an acute rhinitis attack developed during an analytical session. The rhinitis soon subsided and was followed by an attack of bronchial asthma.

CASE HISTORY

Case 4,⁴ an attractive, single, 30-year-old successful fashion designer, applied for analysis because of hay fever, asthma and urticaria. She welcomed the opportunity of being analyzed as a research case because of an intense conflict over homosexual impulses, which kept her in a constant state of anxiety. It had been impossible for her to establish any satisfactory heterosexual relationships, even though she had a great desire to have a home and family.

Autumnal hay fever began at the age of seven. The asthma attacks were non-seasonal but the specific allergens were ragweed, June grass, burweed, marsh elder, sagebrush, timothy, red top and pyrethrum.

The patient was the only living child of her parents, the mother having had an induced abortion before the patient was born and another when she was three years of age. Generalized convulsions occurred at the age of two years, coincident with her training in bowel and bladder control. She had always suffered from constipation.

⁴ This is Patient Y. of the asthma series. See Thomas M. French and Franz Alexander: *Psychogenic Problems in Bronchial Asthma*. Psychosom. Med. Monograph (in press).

The patient described her mother as a very beautiful, intelligent, motherly person who babied her and her father. She believed that the mother was dissatisfied with her marriage, and that she reacted to this dissatisfaction by overcompensatory solicitude toward her family. It was the patient's belief that her mother suffered all of her life from unsatisfied sexual hunger but this appears to be based upon the patient's wish and the mother's untruthfulness rather than upon fact, because once when as an adult the patient suggested this belief to her mother she met with instant denial and an indication that the father was not only potent but had always been quite sexually aggressive. The mother never gave her any direct sex information and although the subject was frankly taboo in the household, some time previous to the beginning of the patient's puberty the mother gave her a book which explained the sex life of birds and animals. The patient stated that this only served to increase her already present confusion. The mother encouraged the patient to confide in her as long as the confidences were not of a sexual nature. The mother practically demanded that the patient in her childhood give a full and complete account of her experiences when they were separated. During adult life this same pattern of behavior was continued in the form of correspondence, and the patient confessed everything to her mother with the notable exception of her sexual impulses and conflicts.

The patient first described her father as a passive, dependent, unreliable, feminine, unsuccessful business man. Later material proved this description to be untrue. The father was not unsuccessful. However, he had frequent illnesses associated with the respiratory function. As a child the patient was very attached to her father, but about the age of 12 she began to resent any overt manifestations of affection by him and at the same time resented his position as head of the household and her mother's deference to him. She resented his lack of success in life, although he was not unsuccessful, and she began at this time to fantasize rescuing the family through being very successful herself. Her attachment to her father as a

child manifested itself in making a mutual interest in her father's hobbies. She spent many hours with him in the woods and mountains. Her father was a great nature lover and he taught the patient a great deal about botany and ornithology. He had wanted her to be a boy, and from the beginning encouraged her attempt to imitate boys in every possible manner.

There is no history of the father's being overly affectionate with the patient in a physical way. There was, however, a definite history of overly affectionate behavior by a maternal uncle, who was quite openly, though probably unconsciously, seductive in his attitude toward her.

The patient as a child was very aggressive and intellectually successful. She made uniformly good grades in school, and obtained a position as a private secretary to a novelist immediately after her graduation from business college. She exhibited considerable talent for drawing and painting before she was five years of age, at which time she began to live out in play fantasies of being a fashion designer. However, her designs were always those of masculine wearing apparel. She designed every article of clothing worn by her father and copied designs from advertisements and haberdashery windows. Many hours were spent arranging her father's ties and in designing new patterns. At the same time she was greatly interested in boys' games. She usually dressed in boys' clothes, either in overalls or Boy Scout outfits. She begged to have her hair cut short and, when this was discouraged by the mother, attempted to trim it herself. She played marbles, baseball and tennis, and competed with boys in all of their games. She learned to shoot when still a very young child and carried her own rifle on hunting trips with her father.

When she was five years of age, she was seduced by another girl into exhibiting herself to a boy of about her own age; they exhibited their sex organs and then both urinated. The patient felt extremely guilty over this experience, and always connected it in her fantasies with her acne. The little boy also developed acne at adolescence, and the patient felt that the skin lesions were direct visitations of punishment upon them

as a result of their behavior. A little later she discovered that she could see through an opening into the shower room used by the high school football players and she felt equally guilty about this indulgence of her curiosity. It is quite evident that she made a rather frantic attempt to sublimate her sexual curiosity in study and voracious reading. As a very young child she began to read everything she could find, spending entire days alone in her room engrossed in books.

Later, work and a career became the major interest in her life. She did, however, maintain a close relationship with several women, particularly toward whom she felt a strong homosexual attraction. One of her friends reciprocated the homosexual attraction and after resisting great temptation to live out overt homosexual relations, they decided to separate themselves as far as possible from each other. This attempt at a homosexual solution was unsatisfactory and proved to be so disturbing to her that it was necessary for her to abandon the association and take flight from the situation of temptation as she did from her home. The homosexual object chosen by the patient was a girl who had been partially successful in replacing her mother in her own family situation and in her father's affections. This father was a dominating figure both in the home and in the business world. There was some evidence that he was sexually promiscuous, and from the beginning of the patient's attachment to his daughter he became sexually attractive to the patient, but this she repressed and denied. When under the influence of alcohol, he often discussed sexual subjects with her and made affectionate gestures toward her. She complained that she could see the outlines of his genitals through his trousers, and that this was both fascinating and disgusting to her. This disturbed her very much and, although she admired his business ability and his aggressive behavior, she made every effort to avoid contact with him, particularly when his daughter was not present. It was this duplication of the original parental situation that made it necessary for the patient to bring about a separation from these mother and father figures.

With most men the patient attempted to play the rôle of a man among men. She insisted upon paying her own way. She depreciated men and felt superior to them, but feared that attention would be called to her homosexual leanings unless she was seen with them. She enjoyed the company of brilliant men, not only successful ones but those who had original ideas about sculpture, architecture, design and other artistic productions.

In the autumn of 1938, the patient had been indulging in a very close relationship with a woman who was overtly homosexual with other women, and who was attempting at this time to seduce my patient into an overt homosexual relationship. My patient, however, was "using" this woman to further her own selfish wishes. She accepted presents, mothering, prestige in social and professional relationships without giving anything of value in return. The patient was openly seductive toward this mother-substitute, and after leading this woman to believe that she was about to accede to her sexual demands, proceeded to reject her.

This behavior was repeated several times in spite of interpretations intended to discourage the indulgence of this thinly disguised homosexual behavior. Interpretations of the patient's gratifying transference reactions outside the analysis were transmitted (confessed) by the patient to the mother-substitute from whom she obtained these gratifications and resulted in the woman's making an attempt to discontinue her interference with the patient's analysis.

Terminating this gratification of a mothering type of attention and indulgence outside the analysis produced an intense anger reaction in the patient. She withdrew from all social contacts and became quite obsessed with her work. Her employer had once asked her to make a comprehensive study of veg-

etable dyes, and at this time the patient began a vigorous and exhaustive study of color reactions and the blending of different dyeing products. Her analytic material was extremely sterile. She reported long, complicated dreams, and either disregarded them or complained that she could not associate to them, but attempted instead to interpret the material schematically. In most of these dreams she identified herself with a little child in a big, confusing world or with a baby who "sees nothing, hears nothing, knows nothing." At the same time, she occasionally reported dream fragments relating to seeing something growing, always with the statement that these dreams were of no importance. To these dreams she associated her fantasies of having a house and garden, of raising vegetables and flowers, and a wish to have a normal sexual life, although admitting that even the thought of heterosexual relations was distasteful to her. She complained that men were careless about exposing the outline of their penis, and expressed the wish that all men should be compelled to wear some sort of "girdle" that would completely hide the presence of the male genital. She said she hated men because they were better paid, for producing less, than women.

In addition to her intensive study of different dyes, she became extremely interested in taking camera pictures of buildings and artistic productions, and said that she was obsessed with the need to be physically active and to satisfy visual impulses. These visual impulses took the form already outlined, together with a compulsion to go to motion pictures every night and then return to her home and read everything she could find relative to dyes. She extended her interest in dyes and colors to mixing paints and observing the different shades of color that could be obtained. Then she began having diffi-

culty with her eyes. Her vision became blurred. She broke her glasses and consulted an eye specialist who recommended a surgical operation for the purpose of opening the tear ducts to permit better drainage into the nostrils. Immediately following this consultation with the eye specialist, she reported the following dream:

The patient was high up in a building, and some one was operating a tremendous camera just outside her window. From the window she could see an alley that was filthy with dirt, garbage and water all mixed together. She knew the odor must be terrible.

In a second dream:

She was a teddybear without a nose.

To the camera the patient associated the analysis and the ophthalmoscope of the eye doctor. She complained of having a severe headache which she attributed to her experience with the eye specialist. She said that experts were no good—they all wanted her to see too much. To the tall buildings she associated ambition, although denying that she was at all ambitious and said she would prefer a home and garden to professional success. To dirt and filth she associated sexuality, but denied any feeling that sexuality was dirty or filthy. To the odor she associated her acute sense of smell, and the use of incense in her room when, as an adolescent, she was preoccupied with reading pornographic literature. To the teddybear she associated childhood play with teddybears with whom she always identified herself, and remarked that no nose meant "not nose; no curiosity."⁵ An inter-

⁵ In this connection, two of my other hay fever patients made identical speculative formulations relative to this formulation. They came to the conclusion that no nose (inflammation of nasal mucous membrane sufficient to inhibit or destroy the sense of smell) meant "no nose, no must not, no external prohibitions against sexual curiosity," but that with the threatened emergence of sexual curiosity the prohibition became internalized and constituted a super ego identification with the forbidding parent.

pretation of her great need to repress and intellectualize her sexual curiosity illustrated by the large camera, her identification with an inanimate object without a nose and her remark about the experts who wanted her to see too much was made at this time with the suggestion that this need for repression was apparently induced or influenced by the feeling that the repressed material was filthy and disgusting to her.

The next hour the patient reported the following dream:

The patient felt sexually attracted to a young man who was standing in front of her. The man was the patient's brother, although the patient was an only child. He aroused more of a sexual interest in her than she had ever felt for any man. He had beautiful hair, his clothes were dirty, his pants were not pressed and he had "stinky" feet.

In association to this dream, the patient claimed to possess an almost unbelievable ability to distinguish different odors. She said she could distinguish odorous foods and substances at a great distance, could distinguish people by their odor, could detect menstruation in women, could recognize the presence in the house of a dog or cat even though unseen and that she could detect the slightest beginning of decay in animal proteins. She said that when she had hay fever her sense of smell was greatly impaired. To the man in the dream she associated first herself and then her father, and remarked that his breath was now very offensive to her although this had not been true when she was a child. She remembered that her father had "smelly" feet, and that he was not always careful about his personal appearance. She recalled how male dogs sniffed at the genitals of her female dog, and remarked that in most respects dogs were cleaner than humans. Then she remembered another dream of the same night:

Some woman offered the patient two bananas on a plate. This woman was about to offer the patient a third banana, when the patient refused the plate. The bananas looked as though they had been heated or cooked.

The patient's first association to this dream was a memory of having seen when she was a child the burned skin of a naked man sunning himself. She believed that the man was entirely naked, and that she was fascinated by the sight of his penis. Then she recalled that her mother had had two miscarriages, and remarked that she was the only one of the mother's pregnancies that had not been killed. The patient said that was not because she was wanted, but that the pregnancies had probably all been accidents, that all children were accidents, and that no parents ever really wanted to have children.

The first of these two dreams is of particular interest because of the obvious reference to the conflict over visual sexual and olfactory sexual stimulation. Both the hair and the feet are, to use Freud's terminology (5), raised to a fetish, the hair is beautiful and the feet are "smelly." However, the olfactory interest in the feet is not repressed; in the dream the patient actually hallucinates the smell of the odorous feet. The dream begins with a strong sexual interest in the man; as she states, stronger than she ever felt for any man. Her first association to the man is to herself. As we have seen in previous material, the masculine protest reaction represents her first line of defense against forbidden sexual temptation.⁶ In this dream the confusion between visual and olfactory stimulation is clearly shown; the man's hair was beautiful, his clothes were dirty, his pants

⁶ The father's attitude toward her as a child, of encouraging masculine identification, probably also influenced this attempt at solution of her conflict.

were not pressed (*i.e.*, the outline of the penis was visible), but he had "stinky" feet. In her associations she referred to the sexual curiosity of dogs and by inference indicated that both visual and olfactory sensation are determinants of sexual stimulation in the human as well as in the animal. In this dream, as in fetishism, visual curiosity is inhibited and olfactory curiosity is intensified; the patient tries to substitute through displacement both above (hair) and below (feet) strong smelling objects for the real object, particularly the father's genitals.

Following these dreams, the patient reported dreams of inhibited curiosity with displacement on to buildings, landscapes, women who wore masks, tremendous parks, big lakes and great waterfalls. She was always trying to arrive some place, but when she attempted to reach her destination she would find it necessary to wade through mud and filth. In the analysis, the patient became exceedingly defiant and demanding. She threatened to have overt homosexual relations, demanded that the analyst do something to help her—the nature of which she could not state—but she wanted the analyst to tell her exactly what to do and what not to do in all her social contacts. When the analyst did not assume this protective-mother rôle, she developed an acute rhinitis, and reported the following dream:

The dream began in a restaurant. The patient, the analyst's wife and the analyst were about to have a meal together. The patient was eating potatoes and meat. Then the scene changed, and the patient was eating the upholstery—particularly the hair—out of the analyst's couch. She felt that she was eating "down too low."

In association to the dream, the patient expressed great hostility for a male patient, with whom she was well acquainted. She said she knew that the

analyst's couch was stuffed with feathers, not with hair. Again she complained of poor vision, and said that her eyes were blurry and watery. She disclaimed any interest in people, particularly men, at the same time expressing a wish that she could be interested in some man. She complained that men and women only used her for entertainment. She said that as soon as she removed her glasses—which she had done before coming to her appointment—she began to have a headache, her eyes felt blurry, the nasal mucous membrane began to feel sensitive, and her breathing was obstructed. She also complained of severe nausea, and said that she had vomited her breakfast. She recalled an incident that occurred soon after leaving her parents' home. She was riding with a man whom she had just met. He fondled her breasts, kissed her, and attempted to pull her head down into his lap. His penis was exposed and erect. She was furious and experienced a severe attack of nausea. However, she attributed the nausea to the cocktails they had had before dinner. As this hour progressed, the patient developed an attack of rhinitis that lasted for two days, and was then followed by an attack of asthma.⁷

The dreams reported begin with those of inhibited or forbidden curiosity. The patient has a need to satisfy her visual sexual curiosity, but this is inhibited and projected. The curiosity regarding the mother's pregnancies is displaced and symbolized in terms of things growing from the ground. She makes almost frantic attempts to substitute other forms of visual satisfaction on an intellectual basis of sublimation in work, photography, visual learning and constructive attainments. But even these

⁷ During the analysis of patient's suffering from both hay fever and asthma, I regularly observed that a mild hay fever attack often preceded an attack of asthma.

attempts of substitution in the reality situation demonstrate the admixture of visual and olfactory conflict. Much of the curiosity has to do with dyes, colors, paints and soil, and in her dreams there is always the need to go through something dirty and smelly. Sexuality is always pictured as dirty and filthy. The dream material shows a gradual progression of the thwarted and unsatisfied curiosity, reaching a climax in the dream where she finds it necessary to deny all curiosity (either visual or olfactory) and identifies herself with an inanimate object (teddybear) without a nose. In the dream of the large camera, the curiosity is all projected on to the analyst, but at a distance she can see dirt and filth. There is a great need to distance the curiosity that the analysis has mobilized, which is pictured as dirty, filthy, and as having a bad odor.

This need to distance and repress the visual curiosity and to substitute anal (olfactory) curiosity is a result of the intensely aggressive character of the impulses that are mobilized by seeing. For this patient, to see meant to wish to grab, to take, to injure, to possess.

With the confession that although her father's breath is now offensive (it was not always so), the patient remembered another dream of the same night, a dream in which she refused something a woman offered her. The symbolism of the bananas as well as the oral-incorporation impulse appears self-evident, but there is probably considerable condensation and overdetermination in this dream, because her associations refer to seeing—satisfied curiosity—in the sense that she saw the naked man's penis, but an unsatisfied sexual impulse in that it was fascinating and sexually stimulating. She also associated her mother's two abortions, and expressed the belief that her mother was a murderess. In her associations to the dream, the patient confused some-

thing she remembered seeing—the man's naked, burned body and penis—with something she repressed—her hostile, oral-destructive reactions to the mother's pregnancy. She denied her destructive impulse toward baby and penis in the dream by refusing the bananas. The attempt to project the oral-destructive impulses on to the mother is unsuccessful as shown in the last dream quoted. In this dream the patient makes a direct oral attack upon the analyst's couch, eating the upholstery, particularly the hair.

In this dream the couch (bed) is the place where she spends an hour each day concentrating upon the conflict between wish and inhibition of sexual curiosity (which is so castrative in character) and sexual satisfaction; (the reference to the bed as the place where the parents had sexual relations and the place where the mother had the miscarriages is obvious). The analytic couch, like the parents' bed, is intimately associated with bodily odors, and the male patient toward whom she developed so much feeling of antagonism occupied the couch each day just before the patient.

Several times during the analysis, the patient brought dreams in which the analytic couch was identified with a toilet; to use her own expression: "A place to defecate," a place to get dirt and filth out of her system. As an adolescent, the patient also lay on a couch reading sexually stimulating literature while inhaling burning incense. In the dream the analytic couch is stuffed with hair but, she says, she knows very well it is stuffed with feathers. As a child the patient often went duck shooting with her father, and during the analysis she reported several dreams in which the parents (particularly the mother) were identified with ducks. It would appear then that the oral attack is directed toward the genitals of both parents. The

patient also associated an experience in an automobile in which the temptation to orally attack a man's genitals was denied with a marked, nausea reaction. She had experienced nausea and loss of appetite during this period of the analysis, which makes it probable that in the dream the patient's sexual impulse takes the form of an oral attack upon the analyst's genitals, but out of fear of retaliation and loss of love the impulse is repressed and the symptom of denial is substituted. It would appear then that the visual curiosity is intensely sadistic in character and that the olfactory displacement of sexual interest represents a masochistic attempt at solution of the sadistic impulse.

The bodily odors remaining in the couch are equally as stimulating as the sight of the genitals, and it is probably significant that with the failure of sublimation and substitution in the visual sphere, the olfactory sphere becomes overcharged and this leads to inhibition. When this occurs the eyes and nose (the organs of sexual curiosity) assume the character of sexually stimulated genitals with congestion and increased mucous secretion. This results in a diminution of both olfactory and optic sensitivity.

SUMMARY AND CONCLUSION

An attempt has been made to demonstrate certain psychological similarities with particular emphasis upon the persistence of preoccupation with olfactory stimuli in seven cases of hay fever that were psychoanalytically studied. Significant unconscious material reported by one patient who suffered from severe seasonal hay fever preceding the advent of an attack of severe acute rhinitis is presented and discussed.⁸ In this case, material is pre-

sented to show that, when repressed *sexual* curiosity relating to the function of reproduction became mobilized in the analysis, the patient made an extreme attempt to sublimate the curiosity along visual, intellectual lines. This attempt represents and may be considered a normal process of sublimation. It was not the manner in which the patient tried to solve this conflict but the intensity of the effort and the emotional need to sublimate the curiosity that is significant. The material reported during this period shows that efforts at sublimation in the visual sphere did not succeed because the aggressive character of the visual curiosity necessitated the substitution of a more primary olfactory curiosity. The dreams demonstrated that external olfactory stimulation remained as an effective source of stimuli and conflict. This led to the establishment of a vicious circle that was temporarily terminated in the production of a conversion symptom which in varying degrees of intensity produced membranous congestion with a corresponding diminution in both olfactory and visual perception.

An analysis of the unconscious material reported by the seven cases studied by the psychoanalytic method makes it possible to hypothecate the specific psychological factors in patients suffering from hay fever. The interplay between these inner conflicts, attempts at their solution and the external agents (specific pollen allergens) which precipitated the actual hay fever attack remains unknown. Either a specific constitutional hyperosmia leads to the sense of smell as a regressive solution to dangerous curiosity or the regression itself produced the hyperosmia and nasal sensitivity to pollen. The physiological principle relative to summation of external and internal stimuli may solve the problem of the inter-

⁸ An analysis of the motor manifestations of this symptom, particularly sneezing, has been deliberately omitted in this discussion because this aspect should constitute the basis for a separate study.

action of psychological and allergic factors in hay fever. Patients who as a result of their psycho-sexual development have substituted olfactory for visual sexual curiosity may, because of this, become more sensitive to pollens. Olfactory curiosity that has never been relieved may be considered to be a constant irritant to the mucous membrane of the nose. An added irritation from an external agency such as pollen may produce an attack. It is possible that there are cases in which the local sensitivity alone in the absence of psychological stimulation may be sufficient to precipitate an attack. It may be assumed that sometimes, as in this case, when the psychological stimulation was increased by the mobilization of repressed sexual tension, this alone sufficed to produce an attack of rhinitis. This would explain the resistance to pollens that was obtained by patients who were exposed to psychoanalysis. When the genital in-

hibitions and the chronic psychological stimulus was eliminated the pollen irritation could no longer precipitate an attack.

BIBLIOGRAPHY

1. ABRAHAM, K.: Remarks on psychoanalysis of a case of foot and corset fetishism. *Selected Papers*, Hogarth Press, London, W.C., 1927, p. 125.
2. BRILL, A. A.: The sense of smell in the neuroses and psychoses. *Psychoanalyt. Quart.*, 1: 42, 1932.
3. DALY, C. D. and WHITE, R. S.: Psychiatric relations to olfactory stimuli. *Brit. J. med. Psychol.*, 10: 70, 1930.
4. DUNBAR, H. F.: Psychoanalytic notes relating to syndromes of asthma and hay fever. *Psychoanalyt. Quart.*, 7: 25, 1938.
5. FREUD, S.: A case of obsessional neurosis. *Collected Papers*, Hogarth Press, London, W.C., 1925, p. 383.
6. GRINKER, R. R.: A comparison of psychological "repression" and neurological "inhibition." *J. nerv. ment. Dis.*, 89: 765, 1939.
7. HIRSCHFELD, M.: *Sexual pathology*. Rev. ed., Emerson Books, Inc., New York, 1940.
8. KRAFFT-EBING, R. V.: *Psychopathia Sexualis*. Rev. ed., Physicians and Surgeons Book Company, New York, 1924.
9. WILSON, G. W.: The red headed man. *Psychoanal. Rev.*, 25: 165, 1938.

SOME OBSERVATIONS ON THE RELATIONS OF EMOTIONS AND ALLERGY*

LEON J. SAUL, M.D.**

IN HIS PAPER, Dr. George Wilson has confined himself to a study of the psychological features in his analyzed cases of hay fever. He has deliberately avoided becoming involved in a question which can not be adequately answered at the present time, namely, the relationship between the emotions and allergic sensitivity. His findings clearly demonstrate the importance of the patient's emotional state for the development of the hay fever symptoms. At the same time the importance of pollens and other irritants for the production of the same symptom is generally recognized and fully established. It may be that the hay fever is only a symptom which may have a number of entirely unrelated causes of which allergic sensitivity is one and the emotional state may be another. On the other hand, should a constant emotional factor of a certain kind be found in a large series of recognized allergic cases, then the supposition would be justified that at least in these cases there was some relationship between this regularly found emotional factor and the sensitivity to allergens. From the present literature, and my own experience with psychoanalyzed allergic cases, it seems to me that such a constant emotional factor is present. This conclusion was further supported by the material presented by Wilson, particularly the case of the one girl described by him in detail who

showed a very strong passive attachment to her mother. In the following discussion I shall depart from the excellent example of caution set by Wilson and advance a general summary of my experience with allergic cases and a preliminary theory as to the relationship of the emotional and allergic factors.

Three patients analyzed by the author presented material which confirms the findings of Wilson that a factor in the production of the symptoms of hay fever is libidinal desire which is repressed and which affects the nasal mucosa.

Case A. is one of those reported in the monograph on asthma (3). This was a young man of thirty-two who had a severe seasonal hay fever since the age of eleven and, in addition, asthma since his early twenties. He had been dominated by his mother who was also seductive and had him sleep with her until he was eleven years old. This was discontinued because one night he touched her breasts. It was at the age of eleven when he no longer slept with her and left her for the first time to go to camp that his severe hay fever developed. This immediately suggested a connection between his hay fever and longings of a sexual nature for his mother (in addition to the possibility of new allergens at the camp). He had had coryza, colds, and bronchitis more severe than the average and apparently allergic in nature since very early infancy. His mother opposed his marriage. The patient repeated toward his

* Expanded from the discussion of Dr. George Wilson's paper, "A Study of Structural and Instinctual Conflicts in Cases of Hay Fever," read before the Chicago Psychoanalytic Society, October 4, 1940.

** Institute for Psychoanalysis, Chicago.

wife the dependent attachment he had to his mother and when he came to the analysis, although thirty-two years of age, he was still going to school and being supported by his wife toward whom he repeated with great exactness many of the attitudes he had toward his mother, including sleeping in the same position. He felt that he did not have a normal potent adult masculine sexual attitude toward her but was really her little boy. This was his main problem.

The next patient, Mr. B., a middle-aged man and a life-long sufferer from moderately severe seasonal hay fever, was first spoiled and then severely neglected by his mother. He turned to his father but felt disappointed by him also. He reacted with the attitude "I don't want anything from her anyway" but went through life with the attitude "If I expect nothing from anyone I won't be disappointed," and was bitter and cynical because people always made demands upon him, not giving him all the personal interest and affection which he craved. He dreamt repeatedly of his mother. Although he tried to show himself as independent, hard-boiled, and masculine, if he heard of someone going out of his way to do something for another person, even if only in a movie or on the radio, tears would stream down his cheeks. He saw a play in which the wife waited on the husband, having his slippers out for him, holding his coat, and so on. This tremendously impressed the patient. He resented his wife's desires for attention, affection and sexual satisfaction from him and longed for a maternal woman who would only give love and care and personal warmth to him. This longing for his mother and her love, with bitterness at its frustration and at the demands of life, was his central emotional problem.

In the third case, that of Mr. C., the

hay fever was perennial rather than seasonal, although, like the other patients, this young man of thirty showed the usual sensitivity on skin-test to the ragweed and tree pollen groups and to a number of foods. In this case also the attachment to the mother was the central problem, with turning to the father which was very conflictful. The mother had been dominating, restrictive and extremely overprotective.

Thus in these three hay fever cases the basic problem was the longing which originated in the relationship to the mother. The importance of just this component of the sexuality for the nasal congestion and secretion is indicated by a review of those situations in which the symptoms occurred. The thirty-two-year-old man, Mr. A., had one of his most severe periods of hay fever at a time when he had to finance an operation for his wife and was forcing himself to work about sixteen hours a day. This lasted through the heat of the summer and the patient's hay fever continued in extremely severe form rather than being relieved as usual between hay fever seasons. One of his severest periods was at the age of about thirteen. It occurred just when the patient stopped going with his gang of fellows and got a job in a drug store at which he worked very hard while at the same time he had three or four boys working for him taking care of lawns.

The occurrence of the hay fever symptoms in these situations suggests that it was related to the patient's wish to escape from the excessive demands upon him. In the background was the wish to go to his good indulging mother. In any difficulty this patient would run to his mother. For example, when in late adolescence a girl tried to seduce him he ran to his mother to confess and to reassure himself of her love. He felt that fighting was masculine but when on a few occasions he would force him-

self to fight and actually did very well, his nose would run and tears would stream down his cheeks.

This patient developed hay fever symptoms out of season, in December, during a visit to his employer and the employer's wife, just when the latter crossed her legs so that the patient could momentarily see her step-ins. The rôle of the sexuality in this example is clear and in the patient's psychology the employer's wife was in a mother relationship to him. This incident shows the mechanism described by Wilson, the hay fever following the inhibition of the looking. He developed hay fever at the end of March when the termination of his analysis was discussed with him. This was well before the time his hay fever, which was strictly seasonal, usually occurred. His reaction was that if the analysis was to be terminated that spring he would go home immediately after it to visit his mother. He was unconsciously very angry at the prospect of being pushed out of the analytic situation in which for an hour a day someone was exclusively concerned with him and his problems, and felt that if he could no longer get this from the analyst he would go to his mother. His pride and the insight gained from the analysis prevented him from taking such a dependent receptive attitude toward his wife and incidentally later weaned him pretty well from his excessive attachment to his mother. The point is that he developed hay fever symptoms at times when demands were made on him and when he wished to escape from them. The direction of his escape was toward his mother, for whom his longing was increased at these times.

Three attacks of hay fever in Case B., the middle-aged man who was rejected by his mother and dreamed of and longed for maternal buxom women, will illustrate the same mechanism in a

different individual. One evening in the middle of March the patient's wife refused sexual relations which the patient wanted and the patient developed hay fever symptoms at that point. He turned over and went to sleep and dreamed that he was in bed with his wife and practiced fellatio for which he was ashamed while the neighbors looked in, and after that a large maternal woman with a shopping bag of food over her arm came in. This all occurred in his home town. He immediately associated the maternal woman with his mother. In his typical fashion he reacted to difficulties with his wife by wanting to go home to mother. The scopophilia is seen here also. He had come to the analysis as a last resort to save his marriage for he wanted to leave his wife in the hope of finding a woman who would be more maternal and so satisfy him better. In other dreams his wife was regularly equated with his mother. On May 5 he developed hay fever just following a squabble with his wife associated with wishes to go to another woman whom he had recently met and whom he thought would be more maternal. Another attack, on April 30, occurred when the patient found that that he had to make another business trip and could not go off for a vacation alone with his wife as he had wanted. Thus in this case also, the patient when faced with problems, difficulties and demands, wished to escape from them to a maternal bosom. This protest against meeting the problems and difficulties and the wish to escape to mother were not conscious but repressed and denied by the patients as incompatible with their ideals of independence and masculinity. It was in these settings that the hay fever occurred.

The same was true of Mr. C., the last case mentioned. Attacks occurred regularly when the patient was in situ-

ations in which demands were made upon him which he felt obligated to meet but from which he emotionally wished to escape to his mother. When he forced himself against his wishes the hay fever symptoms would develop.

A combination of these observations with other available data suggests a hypothesis as to the mechanism of operation of emotional factors in hay fever and in allergy in general. The author has reported observations upon the occurrence of common colds in patients in analysis (5). The colds occurred in situations in which the patients suffered intensification and frustration of passive receptive wishes, usually with a prominent oral component (that is, in which the wishes for love, attention, care, help from others were represented in the dreams and associations largely in the form of being taken to dinner, receiving gifts of candy, of being bought drinks, and otherwise being fed). These colds sometimes disappeared dramatically with insight or with the alleviation of the frustration, for example the return of a person upon whom the patient was dependent. This suggested that these colds were not primarily infectious, but that they were perhaps of allergic nature, related to the coryza of hay fever. The author's experience during the past years has amply confirmed this thesis. I have repeatedly observed the occurrence of colds in patients when their analyses have had to be temporarily interrupted, for example by the absence of the analyst for a week or so. I have also observed colds to occur regularly in several patients who were very passive dependent persons when they forced themselves to sustained work. In this they approximate the hay fever mechanism above described.

The next group of data is provided by observations on twenty-seven psychoanalyzed asthma patients. In this study (4), it was found that the close

attachment to the mother was the central feature. The asthma occurred regularly when this was suddenly threatened.

Two young women, both with severe prolonged generalized urticaria have been analyzed by the author. In both of these cases the central feature was deprivation of parental, but primarily of maternal love, in childhood, with consequent strong, masochistic attachment to the father. In the one case (6), the mother died when the patient was two and the patient was exploited by the father and the stepmother received almost no love or regard from them. The other girl's parents overtly preferred the other children and treated her as the ugly duckling or Cinderella of the family. The attacks of generalized urticaria occurred regularly and exclusively when the first patient's longings for love were intensified and frustrated. The second patient has had no attacks since being observed (six months) but her past attacks were under just these conditions. In these cases the longings for love were expressed in the dreams largely in the form of wishes to be admired, to be beautiful, and to have fine clothes. Both patients wanted to be dancers; the first acted in amateur theatricals and the second modelled for artists. The meagre evidence suggests that where the wishes for love are in the form of exhibitionistic desires and relate to the skin and where there is a heightened skin erotism, this operates as one determinant of the skin as a site for the symptom. Wilson's paper has discussed the choice of the nose as the site of the symptom of hay fever as determined by repressed olfactory sexual curiosity. The hypothesis as to the site of the symptom in asthma as described in the asthma study is that the asthma attack replaces a cry which is stimulated by the threatened loss of the mother's love or by the separation from

her, but which is repressed. In the urticaria cases, weeping relieved the attacks and apparently could replace them, it being an alternative mode of expression for the feelings of frustration.

This leads to a general theory as to the mechanism of emotional factors in allergy. In all of these studies of symptoms of an allergic nature in which emotional factors were found to play a rôle, the central emotion related to the symptom was a strong longing for love, basically for the mother's. *This suggests that intense, unsatisfied longing for love affects the individual's allergic sensitivity.* This longing is of the infantile dependent kind of the child for its mother. It further suggests as a hypothesis to be tested, that when this longing is especially intensified and frustrated or threatened with frustration, the allergic sensitivity is increased and the symptoms appear.

Of course such longings are important in everyone but they apparently bear a special relationship to the allergic symptoms when in a certain status. In contrast to this allergic group for example are the functional cardiac cases which serve as a control group. Studies of emotional factors in essential hypertension indicate as the chief emotional tendencies related to the symptoms, not libidinal longings as in these allergic cases, but hostility and struggle with an unsolved conflict situation (1, 7, 8). This difference in the emotional background of the allergic symptoms as opposed to essential hypertension may be of significance for the fact that these two conditions are generally believed to occur only very infrequently in the same individual (2).

The situation appears then to be as follows: The emotional factor which is important for the allergic symptoms in these particular cases is libidinal longing probably basically of the nature of the child's for the mother. This longing

must of course come to expression in specific ways and involving specific body sites in each case. The choice of these particular sites must be determined by specific psychological and biological factors. There is nothing mutually exclusive about these, for allergic individuals usually present symptoms in different organs at one time or another. The specific factors determining the site of the symptoms in the asthma cases are apparently 1) the sudden threat to the attachment to the mother and 2) the repression of the consequent tendency to cry out. Further study may reveal further specific elements. The specific factors in cases of the common cold of the type described above have not been worked out in detail but the evidence suggests that one of these is the frustration of the oral components of the longing. Wilson's paper has demonstrated the specific factors involved in localizing the libidinal longings in his hay fever cases to the nose, namely, the suppression of the olfactory sexual curiosity, which was found to express not an adult genital sexuality but an immature, dependent, demanding attitude. Not enough cases of urticaria have been studied to reveal the specific elements of the skin as the site for the symptom but the three analyzed cases all showed a relationship to the repressed longing which did not achieve genital sexual expression and which apparently resulted in a high degree of erotization of the skin (as seen in strong exhibitionistic tendencies). In all these allergic cases in which the emotions appear to play a rôle in the production of the symptoms, the central factor related to the symptoms was intense, libidinal longing and certain specific factors involving the status of the longing. Its manner of frustration and mode of expression determined the bronchi, upper respiratory passages or skin as the particular sites for the symptoms.

The observation of the relationship of

intense, repressed, frustrated longing to allergic sensitivity provides a theory which takes account of both the psychological factors and the pollen sensitivity, for according to this concept the one complements the other. The situation is this very simple one, that the emotional state leads to physiological changes which either 1) imitate the allergic symptoms or 2) render the tissues more sensitive to allergens or 3) do both; and conversely an individual who is allergically sensitive on presumably an entirely organic basis might conceivably through the very fact of this sensitivity more readily produce symptoms which are psychologically determined. For example, a patient may have seasonal attacks of hay fever due to pollen sensitivity, entirely apart from his emotional state. However, if his longings increase, his hay fever may become more severe. Further, if the repressed frustrated longing becomes sufficiently intense, then the symptoms may appear on this basis alone. An individual in whom certain tissues are constantly stimulated and sensitive because of his emotional state (like a congestion of the nose from a chronic tendency to cry for mother, or of the skin from a chronic tendency to blush) may well be more sensitive in these tissues to irritating allergens. Conversely, it is easily conceivable that an individual whose tissues are irritated by allergens will react more sensitively in these particular sites to emotional stimuli.

It must not be forgotten in all these discussions that when we refer to psychogenic factors we do not mean certain intellectual ideas of the patient, but on the contrary, the emotions, which are powerful and eminently biological. The child's longing for the parent, its anxiety when left alone are deeply biological; they are concerned with the individual's very existence, and when such deep seated emotions

are aroused, they produce far reaching biological changes.

SUMMARY

On the basis of studies now available on the rôle of emotions in allergic symptoms, the working hypothesis is presented that states of repressed, intense frustrated longing are of central importance. This was found in studies of certain cases of common cold, asthma, hay fever, and urticaria. The choice of sites for the symptoms seems to be determined by more specific factors. But whatever the factors in the choice of site for the symptom, the repressed longing, basically for the mother, frustrated or threatened with frustration, plays a central rôle. The longing is only one factor in the production of the symptoms. It operates in some cases independently of, and in other cases together with specific allergic sensitivities. It is related to allergic sensitivity perhaps through increasing this sensitivity in the individual. It also operates apart from allergens by producing similar symptoms. It is a biological factor which apparently influences and complements allergic sensitivity at least in certain cases.

BIBLIOGRAPHY

1. ALEXANDER, FRANZ: Emotional factors in essential hypertension. *Psychosom. Med.*, 1: 173, 1939.
2. COCA, ARTHUR F., WALZER, MATTHEW, and THOMMEN, AUGUST A.: Asthma and hay fever. Charles C Thomas, Baltimore, 1931, p. 227.
3. FRENCH, THOMAS M. and ALEXANDER, FRANZ: Psychogenic problems in bronchial asthma. *Psychosom. Med. Monograph*. (In press.)
4. FRENCH, THOMAS M. and ALEXANDER, FRANZ: loc. cit.
5. SAUL, LEON J.: Psychogenic factors in the etiology of the common cold and related symptoms. *Int. J. Psycho-Anal.*, 19: 451, 1938.
6. SAUL, LEON J.: Psychological situations concomitant with urticarial attacks. Read at the Annual Meeting of the Southern Psychiatric Association, Louisville, Oct. 9, 1939.
7. SAUL, LEON J.: Hostility in cases of essential hypertension. *Psychosom. Med.*, 1: 153, 1939.
8. SAUL, LEON J.: Utilization of early current dreams in formulating psychoanalytic cases. *Psychoanalyt. Quart.*, 9: 453, 1940.

SEX HORMONES AND PSYCHIC CONFLICT A CASE REPORT*

EDWARD S. TAUBER, M.D. AND GEORGE E. DANIELS, M.D.**

THE AIM OF THIS paper is to describe and evaluate the effects of replacement therapy upon a male castrate, with particular emphasis on the sexual adaptation occurring during hormonal treatment. In this presentation a somewhat didactic approach will be used to bring the various elements of the picture into clearer relief. Even though simplification may lead to faulty perspectives and minor distortions, we felt able to avoid those pitfalls by relying essentially upon clinical observation for our working concepts. Preparation for this study was aided by a review of the relevant literature dealing with the effects of castration on the sexuality of the adult male which disclosed the great variability and multiplicity of factors affecting the castrate's sexual performance (Tauber, 3). In another communication we noted the value of supplementing the hormonal studies with intensive psychiatric interviews and found, among other things, that the use to which the castrate put the sex hormone was determined largely by his unconscious needs (Daniels and Tauber, 1).

Since special attention is being directed in this communication to the status of sexual adaptation, a listing of those factors which tend to enhance and impair sexual functioning is indicated.

* This study was made possible by a grant of the National Committee on Maternal Health through funds from the Sex Biology Gift to Columbia University.

** From the Departments of Psychiatry and Medicine, Columbia University, New York, N. Y.

FACTORS CONDUCTIVE TO EFFECTIVE SEXUAL FUNCTION

1. *The normal heterosexual patterns.* Clinical experience has shown that in our culture essentially well-integrated individuals seek heterosexual gratification. The sexual pace, the intensity of the instinctual drives and effectiveness of the execution of the sexual act are prone to show a range of variation whose limits are hard to define. The fact that these limits are somewhat vague has led to the development of much uncertainty in the minds of investigators attempting to seek the normal patterns. In our case report which follows, this will be discussed concretely to give the reader a clear idea of the patient's sexual performance.

2. *The rôle of suggestion.* Probably ever since the beginning of time people have been aware of the relatively powerful effect exerted upon them by parents, parental figures, and persons in authority. As the individual gains his maturity, the suggestive influences normally play a less decisive rôle in his various adjustments to life. Many adults, however, continue to show varying degrees of susceptibility to suggestive factors. Thus, for example, clinicians in every branch of medicine and surgery are fully aware of their abilities to use suggestion effectively, even though they may not set out consciously to use such a procedure. It is not infrequent during the early phases of psychiatric treatment to observe that a person previously inhibited as to his sexual activities will

begin to show definite increase in those activities, because the parental figure of the physician condones the individual's sexual interests through the absence of prohibition. The physician must be on his guard against viewing a resurgence of sexual interest on the part of the patient as something permanent, unless the sexual behavior is maintained satisfactorily after the physician-patient relationship is discontinued.

3. *The male sex hormone.* There is evidence that the male sex hormone improves a special aspect of sexual function and is probably necessary for its occurrence. Many patients receiving this product note the appearance of erections which were not previously present. Frequency of erections may also be increased. Priapism, or penile responses closely resembling priapism, have been reported following repeated injections of androgenic substances. The erections need not be accompanied by pleasurable increases of tension with desire for intercourse. These have often been termed "cold erections" because the individual may be emotionally unmoved, or may feel the response as an intrusion upon his otherwise unromantic attitude. Sexual phantasies and sexual dreams associated with nocturnal emissions are quite common once replacement therapy is begun.

The sex hormone assists in preparing the individual for sexual activity. Yet the hormone can be advantageously utilized only if, over and above this purely physiological effect, there is a wish to participate in a sexual relationship.

FACTORS MILITATING AGAINST EFFECTIVE SEXUAL FUNCTION

One of psychiatry's soundest contributions has been the empirical discovery that a man's assets take care of themselves and that the real therapeutic issues consist in removing man's

liabilities. This concept finds confirmation in dealing with problems of sexual adaptation. The most effective way to achieve mature heterosexual gratification is to remove the obstacles to its realization. Where can these obstacles be found? They are to be located a) in the reality situation, b) in the neurotic conflicts, and c) possibly in unexplored "inhibitory" effects of the sexual hormone.

4. *The reality situation.* The meaning of the reality situation is self-evident. Distinguishing the effects of the reality situation from the effects of neurotic behavior may present difficulties, because the individual tends erroneously to attribute his defections to external events rather than to inner conflicts. The failure to make these distinctions, however, is due to a lack of appreciation of the neurotic factors which are subtle and easily elude the inexperienced observer. Without denying the reality situation, it must be pointed out that it is often over-emphasized.

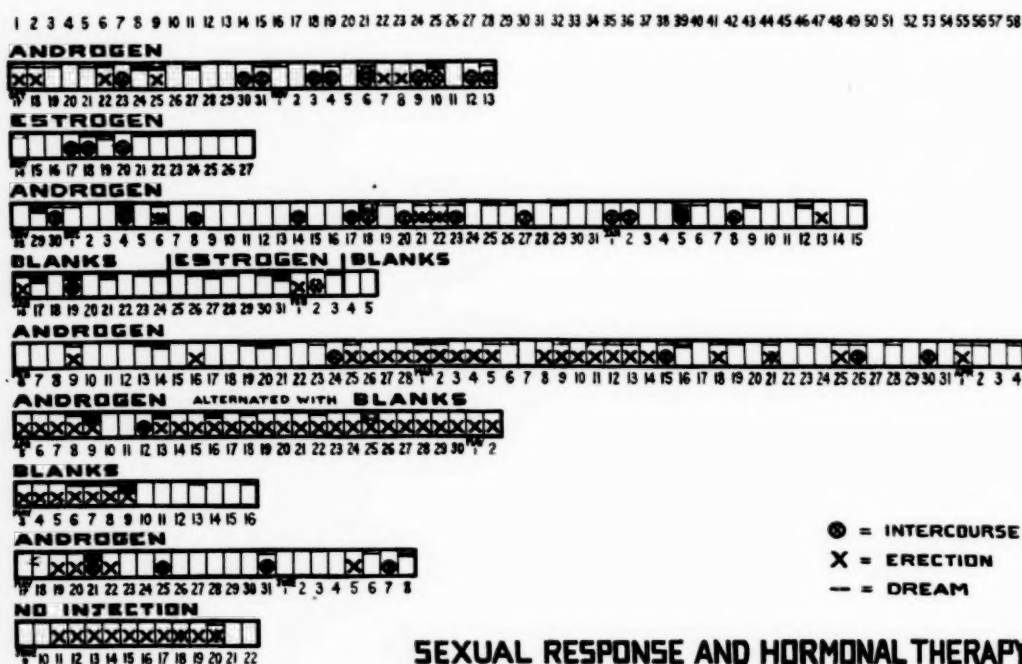
5. *Neurotic conflicts.* There can be little doubt that disturbed sexual functioning in the non-castrate is, for the greater part, an expression of neurotic conflict which may be equally burdensome to the castrate who has carried over his former neurotic patterns. The major portion of this conflict is unconscious. Therefore, the connections between cause and effect are not generally admitted to our immediate awareness. The dynamics of the conflict are made known through the transference relationship. The negative transference requires particular analysis because if it is not worked through, the patient may direct his own destructive trends against the aims of therapy. This last point cannot be stressed too vigorously, for it easily escapes the physician's recognition.

6. *"Inhibitory" effects of the male sex hormone.* The physiological effects of

the male sex hormone are being studied in disease and health in man and animal. Injurious, as well as favorable, effects of androgens have been reported; some of the favorable claims have so far been unsubstantiated (Moore, 2). From the psychological side alone it is conceivable that hormonal pressure in excess of the patient's usual capacities

CASE REPORT (See Fig. 1)

In presenting the case report, we have aimed to confine ourselves primarily to a study of those factors which altered the sexual adaptation. The total period of psychiatric observation extended from March 1938 until May 1940, or approximately twenty-six months. During replacement therapy the patient



SEXUAL RESPONSE AND HORMONAL THERAPY

FIG. 1

to handle it might intensify his conflicts and thus disturb his sexual performance. This would naturally apply to castrate and non-castrate equally.

These six factors, which tend to alter sexual functioning, act in varying combinations at different times. We felt that a painstaking study of a castrate undergoing replacement therapy would afford us valuable clues of such interaction, though we are well aware that the interpretation of the end-result offers genuine difficulties at the present state of our knowledge.¹

¹ We are indebted to Dr. Earl T. Engle, Professor of Anatomy, Columbia University, for the initial sug-

was interviewed three times a week for eight months, and thereafter less frequently. The form of medication administered to him was not made known either to the patient or the psychiatrist interviewing him.

The subject,² a forty-two-year-old, married policeman, developed tuberculosis of the genital tract in 1931 at the age of thirty-four. Six operations followed, resulting in the total loss of both

gestion, and for valuable assistance in the carrying on of this study.

² We are indebted to Dr. George W. Fish, Assistant Professor of Clinical Urology, Columbia University, for this patient, and for his continued help during the observation.

testes, epididymes, and spermatic cords by February 1938. He was first seen by a psychiatrist in March 1938 when a careful study of his pre- and post-operative personality and of the environmental situation was made to determine his suitability for replacement therapy.

The patient was an essentially healthy, non-neurotic person, though there was some question of slight sexual inhibition and of poor object choice in his two marriages. He was born on a farm in Kansas, the second in a family of four siblings. When he was eight years of age the home was broken up by the death of his mother at thirty-three from cancer of the breast. His father remarried, but this marriage was not a success. His father was a worrisome type, and the patient had relatively little contact with him after his mother's death. It is known that his father was very depressed at the time of his death which occurred five years subsequent to his first wife's decease.

The patient's education did not exceed grammar school, and his early years were spent as a farmer. After experiences as a cowhand and jack-of-all trades, he joined the Navy at the age of nineteen.

His first marriage took place three years later while he was in the service. This marriage, by which he had three children, was totally unsatisfactory and resulted in divorce. At the age of twenty-five the patient finally received his formal appointment to the police department. He was assigned to the mounted troop, and after approximately ten years of service, and following the development of his present illness, he was transferred to office routine.

His second marriage, at thirty-eight, to a widowed interior decorator, had taken place three years before observation was started and several years after

the left orchidectomy. He had noted no marked decrease of sexual power following this operation. During the first few weeks of marriage, intercourse occurred, according to his account, almost daily, settling down to approximately once a week until his second illness in October 1937. Following this, intercourse occurred only six or seven times until his right orchidectomy in February 1938, and four times between then and October 1938 when replacement therapy was commenced. There had been no sexual activity for two months immediately preceding.

His second wife was sixteen when her tubes, one ovary, and part of the second were removed. She claimed her response to sexual activity was satisfactory up to the patient's second illness; she said the average number of their experiences was two or three times a month. Following the patient's brief hospitalization in May 1938 for a draining sinus, his wife, who had not been well for the preceding nine months, had a "nervous breakdown" with diarrhea as a prominent symptom. She not only seemed to be quite distressed over the patient's condition, but was also under considerable pressure from her superior in a large department store. Her diarrhea did not clear up until shortly before the patient's replacement therapy was begun.

As it appeared later, this period was of great importance in her subsequent behavior. She appeared outwardly cooperative and eager to have the experiment tried. Anxiety symptoms, from which she had been suffering, could not be interpreted at this time. Just before replacement therapy was begun, the patient's children came to live with him and his wife for the first time. This necessitated an adjustment for everyone, which subsequently proved to have been very difficult for his wife.

*Testosterone Propionate*³ (1), 25 mgs. daily for 28 days (Oct. 17–Nov. 13)

During the first period with testosterone propionate there was an immediate response in dreams followed shortly by frequent erections and essentially satisfactory intercourse in a week (Oct. 23). There had been no intercourse previously for two months and before that, only three times in four months. The patient remarked repeatedly that the execution of the sexual act was as good if not better than it had been previous to his illness. It is of interest to note his observation that the amount of ejaculate produced seemed to be the same as in former days.

During this particular period he produced a great deal of dream material containing aggressive and erotic (masturbatory, homosexual, and heterosexual) components, as well as some evidence of castration anxiety. The dream material at the very outset was of interest. For example, the very night after his first injection, he dreamt that he had an erection, but was unable to recall anything else, and added that he did not really know whether he had an erection. The next night (Oct. 18) he produced a dream in which he walked up a long staircase preceded by an old man and an attractive young woman. When he reached the top he observed that he was in a night club. He drew six pay checks from his pocket in order to cash them and pay the proprietor some money he owed him. The old man left the girl and the patient went up to her and danced with her. The night club was a "shady joint" and he suspected foul play, and was afraid to remain there because he had so much money on him. Besides, it had been impossible for him to wear his revolver

because of the pain in his side. He, therefore, started to leave as quickly as possible, and while descending the long staircase, he noticed a man lying on the steps as if asleep. Suspecting a ruse, he swung over the banister and a beam. The man grabbed him, however, and the two fought on the staircase, fell off it, and dropped a long distance, but were not hurt. As the patient made another effort to leave, he was attacked by two more men but was able to beat them in the struggle. He found he was holding a long piece of rope in his hand which made him very confident. The alarm clock awoke him. His associations to the dream brought out the fact that he had been somewhat afraid of his own capacity to deal with criminals since his illness, and that he believed he would be more likely to use his revolver than formerly. His remarks about the rope brought back his earlier days on a ranch where he was quite expert with the lasso. The dream seems to suggest generally his reawakened interest in sexual activity, certain anxieties which were associated with such anticipations, and a certain amount of struggle with the anticipation of ultimate success. The dream is of interest in that it portrays this man's essentially optimistic conception of himself, his resourcefulness, and his ability to deal with difficult situations. It is of importance because it is a relatively accurate representation of his ability to adapt himself to the world about him.

In a dream the next night (Oct. 19) he set out by automobile in the dark of night to search for his son. He went to the home of a married couple. The husband suspected the patient of attempting burglary and arose from his bed—having on a policeman's uniform—and held up his arms in surrender. He explained that the patient's son was in the hospital. The patient's associations to this dream revealed his disappointment in his children. They ap-

³ The testosterone propionate (Perandren) was kindly made available by the Ciba Pharmaceutical Corporation through the courtesy of Mr. Robert Mautner.

parently did not measure up to his expectations. Certain more general implications of the dream suggest that he anticipated being misunderstood and coming into conflict with the law in his efforts to get to his son. The possibility that his enhanced sexual interests would bring him into conflict with his son may have necessitated an aggressive attitude toward him, *i.e.*, the need to see him in the hospital.

The week after the onset of androgen therapy, he had a short dream (Oct. 24) to which he associated with fears about the treatment and with the expectation that he might infect himself with the needle and have to return to the hospital. Again the question of whether the anticipation of sexual rejuvenation was conducive to sexual conflict and an explanation of the self-destructive notion of hospitalization, as arising from the sexual conflict, had to be considered. This particular dream followed his first sexual contact with his wife (Oct. 23).

The next night (Oct. 25) he had a dream of having had intercourse, with a woman he had known a long time before. The intercourse was extremely satisfactory, and he believed he had an ejaculation in the dream.

During the next fifteen days (Oct. 30–Nov. 13) the patient had intercourse ten times. Some of his significant remarks concerned his sudden distress over the possibility of his son's masturbation. He also said that he himself had done poorly on a police examination and thus was not entitled to promotion. All in all, however, he claimed that he was feeling full of vigor and energy and that he was quite satisfied with his various activities.

Just prior to the termination of the first period of testosterone propionate the patient had a lengthy dream (Nov. 10) which related directly to the transference situation and contained notions to the effect that the doctor was displeased with him and did not consider

his remarks correct or adequate, and that the doctor was not going to make matters any easier for him by providing the proper answers. The patient was somewhat distressed at having to report the dream and apologetic about its more or less obvious connotation. He was completely in agreement with the meaning of the dream, but he saw that in some way he resented the behavior of the doctor and the fact that it was up to him to produce the material and draw his own conclusions. This was the first dream which contained obvious negative trends toward the physician, and may represent some feeling on his part that we had certain expectations of him without feeling any obligation on our side to reciprocate. Just why he should have produced this type of dream at this point cannot be clearly answered, but certain possibilities have to be considered, of which the following two may be the most significant. 1) The patient may have reached his capacity to respond to sexual excitation, and the medication was now felt by him to exceed his needs. But his conscious attitude indicated that he must cooperate as an expression of gratitude to us. By acceding to behavior beyond the range of his own scope, the patient's reaction of resentment as seen in the dream is understandable. 2) Another possibility is the fact that some of his infantile conflicts were coming to the surface with associated needs for greater approval, reassurance, and ego fortification. Thus, our passive attitude was felt at this time as a keen deprivation.

Estrone (Amniotin,⁴ 2000 I.U.) or Estrone (Theelin,⁵ 1000 I.U.) daily for 14 days (Nov. 14–Nov. 27)

In the next two weeks the patient was given either Estrone (Amniotin,

⁴ The estrone (Amniotin) was kindly furnished by E. R. Squibb & Sons.

⁵ The estrone (Theelin) was kindly furnished by Parke, Davis & Co.

Squibb) or Estrone (Theelin, Parke, Davis & Co.) in place of the testosterone propionate. During that time he had intercourse on three occasions (Nov. 17, 18, and 20).

He had a dream (Nov. 14) in which he was once more in the clinic, but it looked like a battlefield because it was wide open and in a forest. Many patients were sitting around and a doctor, whom he did not recognize, attempted to saw off the cap of an ampoule. The patient asked for the ampoule so that he could instruct the doctor correctly. He sawed the cap off with such vigor, however, that the contents shot up in the air and, of course, were lost. The patient felt that the dream revealed that he was trying to show the doctor his business, and, therefore, he was somewhat apologetic. It is possible, however, that not only does this dream represent his attitude toward the doctor, but also a desire to discontinue the hormonal treatment. The condensation of these two notions in one dream allow one to venture the possibility that the patient's attitude toward the doctor was the result of a desire to ward off further sexual stimulation.

He dreamt (Nov. 21) that he witnessed two men about to shoot it out together. He finally allowed them to continue and then took the culprit to the sheriff. The scene changed, and he was with a woman in a tavern where somebody knocked loudly at the door. He seemed momentarily frightened and reached for his gun on his hip. The woman reassured him, and a man came in on ice skates. Then this man and the patient skated down a wide roadway. There were people around, and another man attempted to attack the patient with a knife. A struggle ensued and the patient managed to stick the knife into the man's arm, which apparently did not hurt him particularly, and the dream ended. The patient's associations

to the stabbing in the dream led directly to the injections and anxiety about their effects. Also, the man who attempted to stab him was the person he finally overpowered and stabbed in the dream. This dream suggests that the patient wished to direct aggression against the persons who were responsible for his treatment.

Testosterone Propionate (Perandren, Ciba) (11), 25 mgs. daily for 49 days (Nov. 28-Jan. 15)

The second period with testosterone propionate extended over seven weeks during which time the patient had sexual intercourse on fourteen occasions (Nov. 30, Dec. 4, 8, 14, 17, 18, 20, 23, 27, Jan. 1, 2, twice 5, and 8). In addition to the intercourse, he had approximately eight erections distributed over four occasions during the seven-week period. This is of importance because in a subsequent androgen period the incidence of erections is very high and intercourse is infrequent in comparison with the findings during this second androgen period.

At the beginning of this period with testosterone propionate the patient had a series of rather lengthy and involved dreams (Nov. 29 and 30) having to do with "Three-in-One" oil, untrustworthy Japanese, and the breaking of a glass candy box which was amber-colored. The last dream ended in the patient's being angry with his son and boxing him on the ears. These dreams are quite interesting in that there are some identical qualities, the color—of the Japanese race, the "Three-in-One" oil, and the glass candy box—being the same. The patient had detected the yellowish tint of the Amniotin given to him shortly before, and at this particular time he brought out the fact that he felt the medication he was receiving was just as useless as if "Three-in-One" oil were rubbed into him. The dreams illustrated

his lack of trust in the treatment and suggest a wish to destroy the medication (as shown in the third dream). In this third dream his aggression is turned toward his son. It is significant that his anger at his son followed a reduction in his own sexual performance and coincided with his first intercourse in ten days, (Nov. 30)

One week after testosterone propionate was begun he had intercourse again with his wife (Dec. 4). A significant dream that night concerned his contact with the surgeon who performed the various operations upon him. (As a rather ironic sidelight, the patient's first contact with this surgeon occurred when he gave the surgeon a ticket for a traffic misdemeanor, and the doctor retorted sharply, "Some day I will get you for that.") The fact that the surgeon was often non-talkative was most disconcerting to the patient. This was also the prevailing attitude assumed by the psychiatrist. In the above-mentioned dream (Dec. 4) the surgeon seemed rather moody and uncommunicative, and had a cast on his arm. (This referred to an actual situation in which the surgeon had suffered a fracture immediately after an operation on the patient.) The dream implies that retribution, which had been visited upon the surgeon who had injured him through operation and who had been uncommunicative, would be directed now toward the psychiatrist who represents to the patient's unconscious a castrative, uncommunicative figure.

He had two dreams in the middle of this period (Dec. 15). In one of them a chaplain was giving advice to parents on the rearing of their children. In the second dream the patient was in a restaurant, about to have a bottle of beer, when a business rival of his wife's appeared, and he felt obliged to offer the beer to her. Then he found there was none for himself. He went about looking

for a clean glass, found many dirty ones, but at last located a clean one. These two dreams about the chaplain and the beer bear a superficial similarity to the dreams about the "Three-in-One" oil (in which there was a priest), and the amber-colored candy box. His associations to them had to do with his displeasure over his children's school report cards, and probably related to his evaluation of his own lack of sexual proficiency.

Later in this period he had a dream (Jan. 9) in which he rescued a child from railroad tracks as an oncoming train bore down on the victim. This is interesting because subsequently he had several dreams of this type, *i.e.*, dreams characterized by his assisting an infant from imminent destruction. It can be assumed that the child represented himself.

Blanks (sterile sesame oil) daily for 9 days (Jan. 16-Jan. 24)

For the next nine days the patient was put on Blanks. He remarked on January 16th that for the week preceding he had been on a holiday in terms of his sexual relations, because his wife had been ill and because of his own mild disinclinations.

Except for intercourse (Jan. 19) during this period of Blanks, he did not have it again until thirty-six days later (Feb. 24). His wife was ill and there were numerous problems to upset the home life. His younger son broke his leg (Jan. 20) and his older son sent a letter (Feb. 1) which was improperly addressed and reached the patient's wife instead of the boy's mother. This letter contained material which increased the step-mother's feeling that the children were not very cooperative with, or interested in, her. Furthermore, at this time a young, attractive, distantly related cousin arrived in town and eagerly invited herself to dinner

(Jan. 16). This annoyed the patient's wife in whom feelings of jealousy were easily roused. Because of his wife's illness, her temperamental attitude toward the children, and her self-pitying attitude, the patient was dissatisfied with his home life.

a-Estradiol Benzoate (Progynon,⁶ 10,000 I.U.) daily for 10 days (Jan. 25-Feb. 3) Blanks, daily for 2 days (Feb. 4-Feb. 5)

During the following twelve days the patient received injections of a-Estradiol benzoate (Progynon B, Schering Corp.) for ten days and Blanks for two days. His wife went back to work (Jan. 25) although she was not quite well.

The patient dreamt (Jan. 30) about being in his apartment and seeing lions, tigers, and leopards on the fire escape. He got a long pole and pushed it in the direction of the tigers. There was a baby in a crib, but the animals who entered did not touch it. The patient aimed a gun, but it fell apart when he pulled the trigger.

The next night (Jan. 31) he had a dream about the above-mentioned surgeon who asked him to come to the hospital for an operation. The patient wanted to know why he needed this, but the surgeon was impatient and told him to do as he was told.

That same night (Jan. 31) he dreamt that he was about to have an affair with a woman who was naked except for an open kimono, when a big husky fellow arrived and the woman left with him. The patient was angry and woke up with an erection.

These dreams indicate that the patient was feeling some anxiety about his health and his potency, and also disclose his unconscious conception of the doctor's attitude toward him. In this same interview he remarked that he

had attempted sexual intercourse the night before (Feb. 2) and that it turned out unsuccessfully. The gesture of his hand, while he was recounting this, was exactly similar to that he had used while telling about the gun and bullet episode in the dream of January 30th. That night (Feb. 2) his wife had a dream about his receiving glycerine injections. This amused him because it revealed that both their attitudes about medicine were the same. It is interesting, too, at this time, that he attributed his difficulties with sexual intercourse as something the matter with him, and he regarded his former views about his wife's fatigability, their minor altercations, etc., as rationalizations.

He had a dream (Feb. 3), within the same period, in which he was promoted to a sergeant's rank, but felt that the rest of the men in the department would begrudge him his promotion. After he sewed the chevrons on his sleeve (in the dream) he observed that they were upside down. Associated material indicated concealed anxiety in the rivalry situation, with mental reservations as to his meriting promotion. This was followed by further associations concerning his poor work in his examinations. At one time he had aspired to become a sergeant, but now he was satisfied with an inferior rank, its reduced responsibilities, and the exemption from pounding the pavements. He hoped to remain another three years on the force, and thus be entitled to full pension on retirement. This material is probably related to his potency difficulties.

Testosterone Propionate (Perandren, Ciba) (III), 25 mgs. daily for 58 days (Feb. 6-Apr. 4)

The patient was placed on testosterone propionate again for a little over eight weeks. During this time he had intercourse on four occasions (Feb.

⁶ The a-estradiol benzoate (Progynon-B) was kindly furnished by the Schering Corporation.

24, Mar. 15, 26, 30). His first intercourse occurred nineteen days after the beginning of this third period with androgen. This was followed by numerous erections.

He had two dreams in which he rescued a child, once from a swamp (Feb. 14) and another time from being run over by a sled (Feb. 15). It was interesting also that he had a dream (Feb. 9) about "a lot of glassware," which was followed by a scene in which his father-in-law was carrying two yellow cowhide suitcases. It will be recalled that earlier the symbols 'glass' and 'yellow' were associated with his attitude toward the treatment and were a recurrent motif. On this occasion they occurred at a time when he temporarily felt that his veracity was questioned because of a request to interview his wife. In the dream his ill-tempered father-in-law was carrying some planks and threw them into an ashcan. The patient subsequently produced two dreams in which he struck a man with a drawing board (Feb. 19) and later (Feb. 23) he was carrying a plank which he laid down, and, with his fist, struck a man who was a rival for his wife's affection. It was interesting that the surgeon appeared in this same dream. The planks or boards apparently were associated with feelings of aggression, these being in part directed toward the physician and, perhaps, hormonal intervention. And furthermore, his aggression seemed to be linked up with the prevailing decrease in potency. It was at this time that he had several dreams about the surgeon, in one of which (Feb. 13) this man was portrayed as being so impatient and abusive in his home that he was forced to move his office away. All his patients wore bandages and patches. He also had a dream (Feb. 14) in which he was in the hospital talking to the psychiatrist, but he

did not know why he was there. The psychiatrist invited him to cocktails. There was a huge punch bowl with many glasses on the table, and they took a drink. Another doctor, who was older and wore a moustache, was "dressed fit to kill" and had on overalls. This latter doctor rebuked the psychiatrist for spending so much time with the patient.

During the middle of this third period with androgen, when he was having numerous erections, he produced a dream (Mar. 6) in which he was about to undergo an operation at the hospital. A very beautiful nurse encouraged him and he came out of the ether successfully. The operation was a success and his wife was cautioning him not to be too active. This would suggest an improvement in his unconscious conception of himself, but also anxiety about sexual relations.

On March 15th the patient reported that he and his wife had faced issues rather squarely the night before and that he had offered her a divorce or separation if she wanted either, because he thought her constant complaints would eventually lead to such a move. She waived these, claiming she was in love with him, and said she preferred to leave things as they were. There is no doubt that the constant marital complications caused by his wife's illness and her tendency to lose her pep and attractiveness must explain in part his disinclination for sexual intercourse with her.

Just prior to the change from testosterone propionate the patient had a dream (Mar. 28) in which he criticized the psychiatrist for "psychiatrizing." His dreams often revealed the psychiatrist humiliating him in some way, or the surgeon's patients being covered with bandages as if they had suffered extensive mutilation under treatment.

Testosterone Propionate, 25 mgs. 18 days, interspersed with Blanks, 10 days (Apr. 5-May 2)

On April 5th the patient was started on a 28-day-period of testosterone propionate interspersed with Blanks. During this period he had intercourse once (Apr. 12). Thereafter his wife's illness became so severe that she was at times delirious. The etiology of her illness was not clear, and from what one could gather, she seemed to be very weak, dehydrated, and to have lost a great deal of weight. There was also widespread subcutaneous bleeding. According to the patient, the family doctor said she had acidosis and alleged that it was linked up with her worry over her husband. At this time the patient had a dream (Apr. 13) which in content was similar to his first dream of going into a café (Oct. 18, 1938) preceded by a woman and another man. In this dream the patient was told that his share of the drinks would cost seventeen dollars. An old Italian approached him, intent upon attacking him with a knife. The patient drew his revolver but at the crucial moment the proprietor urged that there was nothing to worry about and that five or ten cents would appease the old man. The patient put his gun away and after a lengthy search for his overcoat, finally secured it and left. This dream clearly suggests Oedipal material. His anxiety about being stabbed is easily forestalled because he has a revolver. The inclusion of the revolver in this dream would seem to symbolize an improved state of confidence over that prevailing in the first dream (Oct. 18, 1938). In his vocation, however, he still felt somewhat insecure and did not consider himself fit to do emergency duty because he feared an inclination to draw his revolver unnecessarily if challenged.

On April 26th the patient remarked that his wife was beginning to improve,

her appetite was better, and her weight was increasing. He recalled a dream (Apr. 25), however, in which he was called to the scene of a gruesome murder of a woman. The body was found in a backyard and the photographers were there. On May 6th the patient reported that his wife was steadily making progress, that she had no definite desire for sexual intercourse, but that he himself was sure he would be capable of it. Between April 5th and May 9th he had thirty-one recorded erections. This profusion of erections may be in part due to reduced opportunities for intercourse while receiving hormonal stimulation, and to a greater sexual response because of reduced anxiety engendered by less frequent intercourse, such as is commonly observed in the neurotic.

Blanks daily for 14 days (May 3-May 16)

This period of Blanks was not particularly productive. There was no sexual intercourse although he continued to have erections for a week after the testosterone propionate was stopped. He raised the question of his capacity to be a father. He was told that this was impossible despite replacement therapy.

Testosterone Propionate (IV), 25 mgs. daily for 23 days (May 17-June 8)

The patient was put back on testosterone propionate for 23 days. During that time he had intercourse four times (May 21, 25, 31, and June 7). It was interesting that his wife began to menstruate for the first time in many months, and it was at that time that the patient had his only extramarital experience during his treatment (May 25). He had intercourse with his wife once before the extra-marital affair, but his wife was not responsive. Furthermore, it is worth adding that during this fourth period with androgen he

began to feel quite confident again and even took to carrying his gun which, as we know, bothered him before. The patient had several dreams of a sexual nature which consisted essentially of mild petting. After intercourse with his wife (May 31) he had a dream in which he was on a train and his trousers were falling off. He had intercourse for the last time during treatment on June 7th. His wife was again quite unresponsive. He continued to feel distressed over her health, her lack of vitality, and her disregard for her appearance. In addition, she had been very much disturbed over her work and had no inclination to keep her job.

After June 8th all injections were stopped. We planned to implant a pellet of testosterone propionate under the skin to take the place of the androgen injections. During two weeks in which he received no medication of any type, he had practically daily erections. It was also during this period that his wife was hospitalized and was diagnosed as having cirrhosis of the liver and toxic hepatitis. This was a great revelation to us; we also learned for the first time that she was a chronic alcoholic and had been allegedly capable of drinking three quarts of whiskey per week. The patient remarked that his wife was often intoxicated at home. This gave a plausible explanation of a good deal of the tension which had been present in the home environment.

On June 23rd the patient received the testosterone propionate implant two inches below the right nipple, but on August 21st it was decided to implant it into the scrotal sac. It was found, however, that neither site was satisfactory because there was always localized inflammation with a tendency for the pellet to be extruded. The patient had sexual intercourse on June 22nd and 29th, August 13th and September 25th. From September 25,

1939, through February 1940 he had no sexual intercourse. Thus, for a period of approximately eight months after the termination of injections he had intercourse on four occasions. During the last few months of that period, erections became more and more infrequent.

In an interview September 28, 1939 the patient reported that the home situation was about the same. His wife had continued to drink more or less steadily, averaging a half pint of gin a day. He was placed on regular patrol duty for a short period, but was transferred back to office routine after developing a small abscess close to his old operative scars. He had a few dreams during this period but was unable to recall them. About two and a half weeks later the patient reported that his wife had lost fifteen or twenty pounds and was very slightly jaundiced. He recalled one dream in which he passed her on the street without talking to her.

The next interview took place January 13, 1940. The patient stated that his wife had had another episode of alcoholic intoxication after making a fair recovery from the October attack. When she regained her health sufficiently to return to work, she found matters unsatisfactory there and she was threatened with loss of her job. Shortly after the vocational difficulties were patched up, she was walking on an icy pavement, slipped, and fractured the third cervical vertebra. This accident was followed by the sudden death of her father which distressed her deeply.

The patient's last interview was on May 15, 1940, when he came in for a check-up at the physician's request. He had returned to the surgeon due to pain in the region of his left scar which yielded promptly to heat treatment. Two months before, his wife had been delirious for twenty-four hours and had been taken to the hospital where her

cast was removed and replaced by a leather collar and brace. They were getting on well together except for one point of contention—one of his sons, who was not behaving well. The patient's earlier antagonism toward his wife seemed to have disappeared. There had been no sexual interest, desire, or activity. Erections were very infrequent. He had had a sexual dream some time before with an orgasmic experience,

palm of the hand. His manner, on the whole, was quite restrained and non-neurotic.

SUMMARY OF REPLACEMENT THERAPY SCHEDULE (See Fig. 2)

Androgens, estrogenic substance, and/or blanks (sesame oil) were administered over a total period of 235 days. This was followed by no injections for 14 days.

FREQUENCY OF INTERCOURSE BY WEEKS

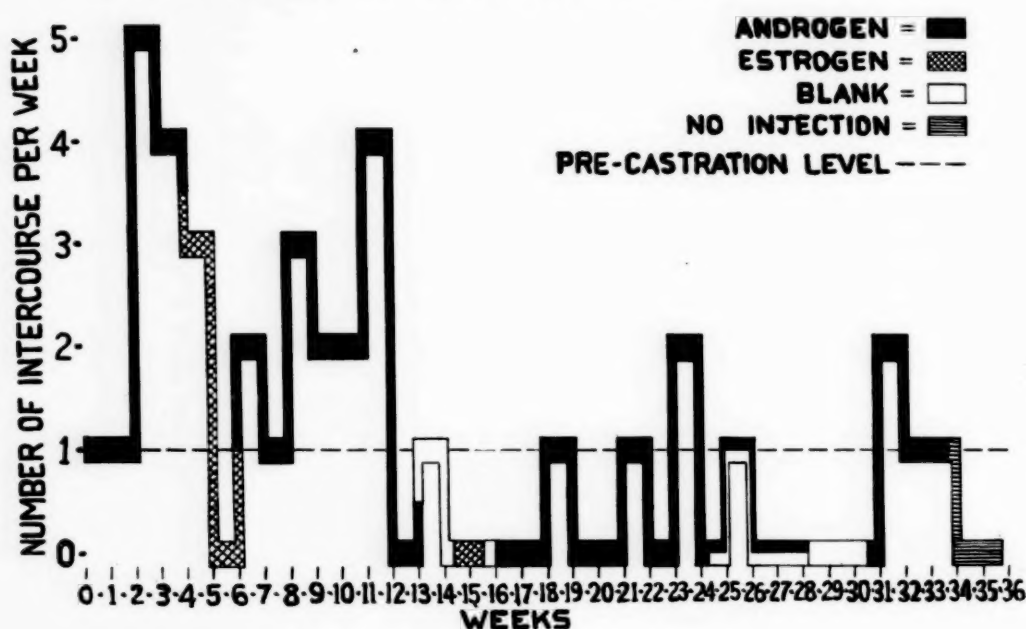


FIG. 2

but he had not recalled his dreams recently. He felt no pressure to improve his sexuality at that time and the impression was gained that under the circumstances he was rather relieved not to have to do anything about it, although he stated that he would be very glad to cooperate again in any experiment that we might suggest to him. He was not suffering from hot flushes. When the physician shook hands with him he noticed that there was a good deal of perspiration in the

There were four periods, of 28, 49, 58, and 23 days each, during which testosterone propionate alone was administered. There were two periods, of 14 and 10 days each, during which estrogenic substances were given. There were three periods of 9, 2, and 14 days each, during which blank injections were given. There was also a period of 28 days of alternating testosterone propionate and blanks. In all, testosterone propionate alone was given on 158 days, estrogens alone were given on 24 days,

and blanks were given on 25 days. Following the 14-day-period of no injections, which ended June 22, 1939, the patient had a pellet of testosterone propionate implanted under the skin of the right breast, on June 23, 1939. In early August this was extruded and on August 21, 1939 another was implanted in the scrotum. This, in turn, was extruded about December 25, 1939. Since that time no form of medication has been given.

SUMMARY AND DISCUSSION

The present report has been directed to outlining the factors which influenced the sexual adaptation of a male castrate. The interplay of the treatment situation, reality situation, and inner conflicts, constituted the frames of reference. Intensive psychiatric interviews combined with a relatively lengthy replacement therapy schedule were carried out. In viewing the trajectory of the patient's experiences throughout the observation period, it is evident that during the early periods with androgen there was a definite increase in sexual pace over and above his usual capacity during the last few years, particularly since castration. With the progression of treatment there was a decrease in the effective sexual expression of the patient which required explanation. The following comments are offered in explanation of the mechanisms which underlay the reduction in sexual activity.

Following castration, an alteration in the endopsychic conception of the individual takes place. The intensity and extent of this alteration is variable, essentially unconscious, but may also be consciously expressed. The castration may incline the individual to a feminized conception of himself. This is corroborated by the patient's dream material, especially those dreams dealing with the transference. The trans-

ference dreams revealed the emergence of a relatively powerful sexual conflict, *i.e.*, the wish to be taken sexually, and also the repudiation of that wish. Since the homosexual conflict is more intense, there will be a concurrent intensification of the patient's hostility toward father-figures, because, by virtue of the homosexual orientation, the patient's passivity is increased. Since passivity is a challenge to the patient's security as well as to the cultural tradition of being virile, it will naturally produce an aggressive response which may or may not be conscious. In this instance, the major display of aggression was seen in the transference dreams and was directed against the physician.

The sex hormone pushes the individual into greater sexual activity. It induces him to follow a path more or less consistent with his basic personality patterns in line with the modifications induced by castration.

Through the introduction of a more prominent feminine component due to castration, hormonal pressure will intensify the patient's sexual conflicts, *i.e.*, being somewhat more "feminine," he has a more severe struggle against his passive cravings. He may, therefore, be unable to cope adequately with sexual tension, because of his increased passivity. Thus, we see that after the castration, hormonal treatment may operate eventually to interfere with effective sexuality.

It follows that the patient's altered ego attitudes must be worked through before hormones are too freely administered. An effort to analyze carefully the negative transference attitudes was not made in this patient, as, in the main, the psychiatrist took the part of an observer. But, ideally, neglect to analyze such material would appear to be one of the most serious technical oversights for the success of treatment.

The next problem is the effect of the

wife's illness and her unattractiveness. This may legitimately disturb the patient's heterosexual expression, and since he is married and not completely equipped sexually, the difficulties of an extra-marital affair are quite real. In support of the greater prominence of inner conflict over the external factors, one must realize that the patient, though married, did not hesitate previously to have relationships with women to his own satisfaction, if he wanted them seriously enough.

Hence, the weight of evidence tends to throw the balance in the direction of inner conflict and altered ego attitudes. One must also bear in mind that in the last year the patient's attitude toward his wife improved considerably when

his own sexual interests became less strong, along with the elimination of the hormone. Thus, although the administration of the male sex hormone temporarily produced a period of sexual rejuvenation, probably capable of repetition, it became evident that the patient's most effective psychic equilibrium was maintained after the discontinuation of hormonal therapy.

BIBLIOGRAPHY

1. DANIELS, G. E., and E. S. TAUBER: A dynamic approach to the study of replacement therapy in cases of castration. (*To appear in the American Journal of Psychiatry*, 97: no. 4, 1941.)
2. MOORE, C. R.: Physiology of the testes and therapeutic application of male hormone. *Bull. N.Y. Acad. Med.*, 16: 135-152, 1940.
3. TAUBER, E. S.: Effects of castration upon the sexuality of the adult male. *Psychosom. Med.*, 2: 74-87, 1940.

A NOTE ON THE INEFFECTUALNESS OF SEX-HORMONE MEDICATION IN A CASE OF PRONOUNCED HOMOSEXUALITY

SAUL ROSENZWEIG, Ph.D. AND R. G. HOSKINS, M.D.*

ONE OF THE major problems with which the psychologist and the endocrinologist are jointly confronted is that of homosexuality. That the overt sexual behavior of the infra-human mammals is largely determined by hormonal factors is well known. Insofar as the temperament can be judged by behavior, this too is involved. Steinach's (3) transformation of male into "female" guinea pigs by castration followed by ovarian grafts showed that homosexuality can be experimentally induced. Domm's (1) work on avian subjects confirmed the possibility and showed that sex behavior correlates both quantitatively and qualitatively with sex-hormone factors. Such evidences could be greatly multiplied. That homosexuality in man may be determined in important degree by imbalance of male and female sex-hormone production is suggested by the recent work of Glass, Wright, and others (2) who report high estrogen-to-androgen ratios in homosexual males.

The availability of a remarkably typical male homosexual patient led us to make an empirical test of the influence of sex hormones upon attitudes and behavior in his case. The clarity of the results, although negative, may justify a brief report of the case.

The patient, A. D., a male negro of 46, entered the Northampton State

Hospital in 1921 and 4 years later was transferred to the Worcester State Hospital with a diagnosis of "constitutional psychopathic personality without psychosis." He had completed the seventh grade of grammar school at the age of 12 and shortly thereafter joined a travelling stock company as a chorus boy. The company was managed by a man whom the patient describes as having been "like a father to me." "I ate with him and slept with him. He was a beautiful man." The patient remained with this company for about a year. Later he worked for two years in a laundry but from time to time took part in amateur performances in which he danced and sang. At the age of 24 a diagnosis of appendicitis led to an operation. Upon discharge from the hospital he learned that his manager-friend had died. This event apparently represented a great blow to him. Shortly afterward he began to show the symptoms which led ultimately to his commitment to hospital. These consisted mainly of seclusiveness, shyness, pronounced effeminacy, and excessive preoccupation with drawing, painting, designing of women's clothes and similar "artistic" activities. His speech became disjointed and unresponsive and for two years he refrained from leaving his home. He talked of wearing women's clothes and often went to bed with presumably imaginary ailments.

Upon admission to the Worcester State Hospital he showed no pro-

* From the Research Service of the Worcester State Hospital and the Memorial Foundation for Neuro-Endocrine Research, Worcester, Massachusetts.

nounced psychotic symptoms. In the diagnostic summary he was described as follows:

He is a short, stocky negro who, except for his large masculine genitals, is in every respect a woman. He shows an exaggerated female gait and speech and all the mannerisms of a clinging-vine type of female, spends hours at his toilette, and says he is fond of being well-groomed. With men he is coy, silly, and affected. With the other sex he talks as one woman to another. He daily asks for cathartics and is overinterested in the needs of his lower intestinal tract. He knows he is considered effeminate, but says that that is the way God made him. He further excuses his peculiarities on the ground that he is an artistic genius and therefore entitled to a few eccentricities. He fully expects to become one of the famous members of his race, which, he says, is the most beautiful of all races. He avoids all references to his sex life but under repeated questioning admits having played a passive rôle in homosexual acts. . . . In brief, we have a negro of passive homosexual type with feminoid make-up, without evidence of psychosis. Mental deficiency, if present, is of a high grade or borderline degree.

During the intervening fifteen years the patient has changed little. He still shows the same pronounced femininity, the same interests in artistic things, especially women's clothing, and a host of habits and mannerisms which express his strongly-rooted homosexuality. He incessantly scrubs and washes himself and his clothing. He spends more time in the bathroom than would a fastidious woman. He chooses words with exaggerated nicety and enunciates them, often incorrectly, with great precision. He is constantly straining to give the impression of a highly refined and cultured lady with esthetic inclinations and perfect taste. His occupation is mending and sewing in the industrial room although he would prefer more creative work. Occasionally, if one takes

him by surprise, he can be overheard carrying on imaginary conversations as he sits alone in his room. These concern fantastic gratifications of his artistic and homosexual interests. A highly characteristic feature is his preoccupation with the movement of his bowels, the significance of which is obvious in terms of psychoanalytic doctrines. He admits that he enjoys violent movements of the bowels and that is the reason why he likes epsom salts. It was assumed that changes in this interest might serve as one indicator of shifts in the strength of his libido.

Sex-hormone medication¹ began with this patient on October 16, 1939, and continued with several variations and intermissions until the middle of April, 1940.

From October 16 to November 20, 1939 he was given orally the potent synthetic estrogen, Stilboestrol (Squibb), in dosage of 5 mgm. three times a week.

On December 6 he received an implant of a 150-milligram tablet of Testosterone (Schering), which was embedded in the subcutaneous tissues beneath the inferior angle of the left scapula.

On December 20, 1939 to February 7, 1940, intramuscular injections were given of a gonadotropic preparation derived from pregnant-mare serum (Anteron-Schering). The dosage was 1 cc. or 250 units twice weekly. Because of an upper respiratory infection medication was omitted during the week of January 11.

An attempt was then made to enhance the responsivity to sex hormones by the use of desiccated thyroid (Armour). This was begun on February 1 at 1 grain daily and continued throughout the remainder of the study.

¹ Our thanks are due to E. R. Squibb & Sons, the Schering Corporation, Ayerst, McKenna & Harrison and the Eli Lilly Company for supplying the various hormone products that were used.

On February 9, Pituitary Gonadotropic—Pranturon (Schering)—was substituted for the pregnant-mare preparation, also in dosage of 1 cc. twice weekly. At the same time Testosterone Propionate by intramuscular injection was begun in dosage of 50 mgm. twice a week. Both were continued until February 29.

On March 9 another estrogenic preparation was begun, Ayerst McKenna and Harrison's Emmenin being used in dosage of 1 teaspoonful three times daily. This was discontinued on March 21.

Finally, from April 6 to 12 another estrogen, Estriol (Lilly), was given in the large dosage, 0.24 mgm. three times a day.

As is well known, Stilboestrol has a tendency to produce nausea and even vomiting. The patient experienced a certain amount of nausea but not enough to warrant discontinuing the medication. This effect aside, none of the drugs of the entire series gave rise to any detectable change of behavior or attitude. In particular, no change whatever could be detected in his preoccupation with defecation.

The dosage of the various preparations was purely arbitrary but was of the order that frequently has been found to be clinically effective in suitable cases. While optimal amounts of some of the preparations may not have been used, it is believed that enough was given to change significantly the estrogen and the androgen titres as well

as the ratios between the two. In the case of Estriol, at least, the dosage was definitely high. Had the personal psychodynamics of the patient been primarily dependent upon hormonal factors it seems highly probable that at least minor shifts of preoccupation and attitude would have been detectable with changes of medication.

As one possibility, it follows that in such cases, in which the homosexuality is of long standing—thirty-five years in this instance—and in which the personality structure has been altered at an early date the autogenous hormonal factors are no longer of significant potency. Neither is the personality-structure amenable to alteration by endocrine medication.

SUMMARY

In a male patient presenting marked homosexuality of thirty-five years' standing a variety of estrogenic, androgenic, and gonadotropic preparations were administered.

No influence upon the behavior or the personality of the patient could be detected.

BIBLIOGRAPHY

1. DOMM, L. V.: New experiments on ovariectomy and the problem of sex inversion in the fowl. *J. exp. Zool.*, 48: 31, 1927.
2. GLASS, S. J., H. J. DUEL and C. A. WRIGHT: Sex-hormone studies in male homosexuality. *Endocrinology*, 26: 590, 1940.
3. STEINACH, E.: Feminisierung von Männchen und Maskulierung von Weibchen. *Zbl. Physiol.*, 27: 717, 1913.

PERIODICAL LITERATURE

A Critical Review of the Recent Literature on Psychosomatic Relationships

THIS IS A review surveying the literature on psychosomatic relationships as listed in the Quarterly Cumulative Index for the first three months of 1940. All articles in British and American Journals are covered except for those that have appeared in PSYCHOSOMATIC MEDICINE.

Since "psychosomatic" does not yet exist as a separate heading in this index the following six headings were searched for literature of psychosomatic significance: 1. Cardiovascular System, 2. Eyes, 3. Gastrointestinal, 4. Skin, 5. Mental Disease, 6. General.

Cardiovascular System

WOLVERTON, B. F.: Nervous Heart. *Journal Iowa Medical Society*, 1940, vol. 30, pp. 106-110.

The author discusses the psychic component in patients with no evidence of structural change in the heart, and in patients with organic heart disease in whom the symptomatology outruns the pathology. He recognizes that the administration of sedatives should be explained for what it is rather than being represented as a specific, and that the patient should not be allowed to infer that it is the latter.

His methodology is to help the patient correlate his symptomatology with his life situation. If the neurosis is so complex and fixed that the cardiologist is unable to do this, he seeks psychiatric assistance.

MCGREGOR, H. B.: Psychologic Factor in Rheumatic Fever. *Practitioner*, 1939, vol. 143, pp. 627-639.

This is a cautious type of article which calls attention to emotional conflicts in rheumatic subjects. After presenting several cases in which the working through

of emotional conflicts resulted in the "losing of the rheumatism" it is observed that the coincidence of rheumatism and emotional conflicts does not necessarily prove a causal relationship. This, it is indicated, could be further established by the contrast of the emotional conflicts and personality types in rheumatics and those in a control group, as has been done, for example, in the case of peptic ulcer.

Such a study might well serve as a preliminary to the more complex and ambitious problem of correlating the "rheumatic state" with a more specific underlying personality structure.

In reviewing this type of article it is difficult to evaluate the underlying motivation for the hesitancy of the writer in claiming a definite psychosomatic relationship. There are three interrelated factors that come to the reviewer's mind, 1) the writer hesitates because the earlier writers claimed so much for the psychogenic primacy with so little objective demonstration; 2) the somatists have such difficulty with the concept that disordered structure can actually be the end result of a process that passes from the psyche via the central nervous system via the autonomic nervous system and the endocrines to the end organ; 3) that while certain specific links in the foregoing chain are still in the process of demonstration this writer feels it perhaps wiser not to claim the whole as established.

GORDON, H.: Anemia As a Problem for the Neuropsychiatrist. *Kentucky Medical Journal*, 1939, vol. 37, pp. 580-582.

This article is not along the major pathway of further elucidating psychosomatic relationships, but calls attention to the fact that in all the recent interest in the psychic aspects of disease some of the major somatic diseases, in this instance, anemia, may really be the primary difficulty and may be overlooked.

Thus a "problem child" is often suffering primarily from a nutritional anemia; also

many adults are sufferers from nutritional anemia and are not psychoneurotic at all. Furthermore, in the realm of clinical neurology in such conditions as pellagra, lead poisoning, and pernicious anemia, the neurological picture may overshadow the hematological one; and in psychotic patients, especially in those who need forced feeding there may develop a nutritional anemia unless the diet is supplemented by anti-anemic substances.

As already stated by the reviewer, this is not really a contribution to the psychosomatic investigation. It is nevertheless interesting to note that the shift of interest to the psychic away from the somatic has been so great in recent years that well recognized somatic disease is occasionally overlooked because of the overwhelming psychic orientation of the physician.

KRAINES, J. H. AND SHERMAN, I. C.: Neurotic Symptoms and Changes in Blood Pressure and Pulse Following Injection of Epinephrine. *Journal of the American Medical Association*, 1940, vol. 114, pp. 843-845.

In an experimental procedure a group of psychoneurotic patients (evidently mostly anxiety states) and normal controls were injected with epinephrine and sterile saline and the following results were observed: 1) the systolic blood pressure and pulse rate of both psychoneurotic and normal persons are significantly greater following the intravenous injection of epinephrine than of salt solution. 2) Epinephrine administered in dosage sufficient to produce changes in blood pressure and pulse rate produces similar signs and symptoms in normal and psychoneurotic persons. These symptoms are similar to those commonly described by psychoneurotic patients. 3) Epinephrine aggravates existing psychoneurotic symptoms and may activate given latent symptoms. 4) From the therapeutic point of view a patient will accept the fact that his symptoms are organic and not imaginary, although their basis may be psychologic."

The experimental findings are hardly surprising, but it is the final notation that deserves the comment. Evidently it is still

unclear in some places that the somatic component in psychosomatic conditions whether structuralized or merely in the functional phase is not imaginary.

Certainly increased blood pressure is not imaginary and palpitation is actually a subjective appreciation of a heart beating more intensely or with a different rhythm or both, than usual. From the point of view of therapy it is precisely this which must be kept before the patient, that it is the combined job of the physician and the patient to work out the connection between the somatic symptoms and the patient's life situation.

ROBINSON, S. K.: Comparison of Medical and Surgical Treatment in Hypertension with Special Reference to Importance of Psychic Factors in Evaluating Results. *Journal of Nervous and Mental Diseases*, 1940, vol. 91, pp. 157-174.

This article also falls into the group of those that make no attempt to correlate individual somatic disturbances with specific types of psychic constellations but urges that there is a causal relationship between certain types of somatic disease, in which the underlying organic pathology is not commensurate with the somatic symptomatology, and the psychic factors which in this group of disease are in the background.

It is essentially a plea for a wider understanding of this type of disease and stresses the point of view that "the usual approach has been that the disturbed physiology makes the body sick. While this is true, it is also true that the disturbed physiology exists because something has gone wrong with the smooth functioning of the organism."

While referring in passing to some of the more ambitious attempts to study hypertension and the allied diseases in this group from the point of view of attempting to correlate somatic disturbances with specific types of psychic constellation, the author's main emphasis is on generalized psychotherapy which he does not detail, but which he seems to limit to reassurance, minimizing the somatic component of the illness and a certain regularity of attend-

ance by the patient to a physician, "who should be the patient's friend and should discuss the patient's business, hobbies, and even his family affairs."

With this approach supplementing drugs, diet, and rest, the author reports a clinical result in 92 cases of hypertension that is considerably better than the results reported by those who have directed their efforts directly at the autonomic nervous system whether by rhizotomy, sympathectomy, or adrenalectomy. He feels that it would be well to discourage the use of operation at the present time for the reasons that the rationale of surgery on the sympathetics is on much less scientifically secure ground than in 1925, that the surgical results have not been so good as the medical-psychological one, and that "psychiatrists with greater understanding of emotional conflicts and the elements of fear, worry, and anxiety in disease, would greatly help in rounding out the present lopsided approach."

BOURNE, G. AND WITTKOWER, E.: Psychotherapy in Cases with Cardiac Pain. *British Heart Journal*, 1940, vol. 2, pp. 25-32.

This article is to be counted with those that imply a correlation between individual somatic disturbances and specific types of psychic constellations. For example, it is stated "that in cases of functional cardiac pain, the pain is nearly always due to transformed anxiety arising from a conflict, unusual in intensity and abnormal in type between menace to vital feelings and existence on the one side and self-preservation and self-assertion on the other. It is almost a truism that those harassed by anxiety develop cardiac pain, if for some reason or other they are affected by some cardiac disorder."

The emphasis here is on the therapeutic possibilities for the relief of pain in cardiacs of two kinds, those with minimal organic pathology and a large psychogenic component and those with considerable organic pathology but whose pain is chiefly related to the psychogenic component.

The psychotherapy employed was a considerably modified psychoanalytic procedure in which the time was limited to

60 hours, or three hours weekly for approximately twenty weeks in some cases, and a more superficial discussion of present conflicts in those with more serious types of organic pathology to avoid severe emotional shock.

The results in relief of pain, resumption of employment, and considerable improvement in the psychic symptoms were excellent in four months of this type of treatment as contrasted with the results from former physical treatment which all these patients had received for from two to three years previously without much benefit.

Eyes

SCHOENBERG, M. J.: Role of Anxiety in the Pathogenesis of Primary Glaucoma. *Archives of Ophthalmology*, 1940, vol. 23, pp. 76-90. Also, Psychosomatic Interrelationships; Therapeutic Indications in Glaucoma. *Archives of Ophthalmology*, 1940, vol. 23, pp. 91-103.

These companion articles are the contributions of a somatic specialist, an ophthalmologist, who attempts to correlate a specific somatic disturbance (primary glaucoma) with the emotional life of its victims. The first article, which is concerned with the rôle of anxiety in the pathogenesis, details the evidence to show a) that the parts of the autonomic nervous system are out of balance, b) that states of anxiety have a different effect on glaucomatous eyes than on normal eyes.

The conclusion is reached that in a certain percentage of cases, states of anxiety act as a precipitating factor for the development or maintenance of a high intraocular pressure in glaucomatous patients, and that, therefore, some of the glaucomatous cases are preventable by proper attention to the patient's emotional life.

The second paper was read to a group of ophthalmologists and concerned itself with the psychosomatic interrelationships and the therapeutic indications in glaucoma.

The three points stressed were 1) a somatic diagnosis without a survey of the patient's emotional life is an incomplete diagnosis, 2) psychodiagnosis is essential to psychotherapy, 3) psychotherapy is sometimes as essential for patients with glaucoma who are under the influence of

states of anxiety as somatic therapy.

The ophthalmologists who commented were in general quite sympathetic to the idea that there is a relationship between the emotional state of the patient and glaucoma.

The major differences of opinion were: a) Since this is an emergency condition there is no time to worry about the pathogenesis and the treatment should be the old established ophthalmological routines, medical and surgical; b) granting the emotional factors in the pathogenesis what can be done after the glaucoma is established?

LAMBERT, R. K.: Spasmogenic Tendency and Its Relationship to Eyes. *New York State Journal of Medicine*, 1940, vol. 40, pp. 334-340.

This article is a distinct contribution to the growing recognition of psychosomatic interrelationships because it is by a specialist in so highly specialized a somatic field as ophthalmology.

The author notes, "that the troubling cases, are, however, those in which the symptoms are out of all proportion to the ocular causes, and persist after these causes have been corrected." After long and careful clinical observation the notation is made that "certain types of individuals are apparently subject to smooth muscle spasm: one, sensitive, high strung people in particular environmental difficulties such as highly competitive or overactive work; two, psychoneurotics; three, individuals temporarily depressed through fatigue or habits injurious to them; four, allergic or drug sensitive individuals."

Besides noting the type of individual who is susceptible to smooth muscle spasm, this author has made the further clinical observation that, "in addition there are generally parallel spastic symptoms, such as spastic constipation, in other parts of their bodies."

Gastrointestinal

LEWIS, N. D. C.: Nervous and Mental Components of Gastrointestinal Diseases. *Medical Annals District of Columbia*, 1940, vol. 9, pp. 42-47.

This article represents an attempt by a

psychiatrist to interpret the modern attitude of psychiatry to internists and surgeons in the field of gastrointestinal disease.

After a brief discussion of the nervous and mental symptoms secondary to the absorption of toxic products resulting from disordered gastrointestinal functioning, and the other group in which the primary pathology is in the nervous system, either as in an expanding intra-cranial process or some other destructive lesion of the nervous system, the emphasis is placed on an attempt to correlate the psychologic, neurologic, and somatic components in peptic ulcer, ulcerative colitis, and anorexia nervosa, i.e. in interpreting the psychosomatic orientation. The author states, "The present mode of teaching still emphasizes irreversible organic factors, ignoring the mental ones, or barely mentioning them, or even treating them with disdain, but we are gradually coming to the point of view that states of mind stimulate or initiate physiologic processes which are very similar to pathologic ones and lead to structural changes, and that perversion of function can easily lead to structural changes," and also, "the gastrointestinal tract lends itself readily to emotional influences which produce alterations in the tonicity and secretions of these hollow mobile organs. Here malfunction can result in structural pathology and a relatively large number of illnesses begin here on a functional basis."

Skin

Article previously reviewed, 1940, vol. 1, p. 90, Klaber, R. and Wittkower, E.

Mental Disease

SATTERFIELD, G. H., MCKINNON, W. S., HOLMES, A. D., and TRIPP, F.: Calcium and Phosphorous Content in Normal and Mentally Diseased. *Journal of the American Dietetics Association*, 1940, vol. 16, pp. 117-123.

This article does not stand in the major pathway of attempting to elucidate psychosomatic interrelationships. A group of very varied mental cases made up of 17 mental defectives with psychosis, 11 mental

defectives, 57 schizophrenics and 12 other miscellaneous mental cases, ranging from psychoneurosis to undiagnosed psychosis, were checked against twenty normal controls to find out whether or not there was any difference in the calcium and phosphorus of the blood of mentally diseased and normal people.

The experimental findings were that the calcium and phosphorous content of the blood of nearly all the patients with various types of mental disease was within normal limits.

MUCHLIG, W. A.: Schizophrenia; Neurologic Signs. *Journal of Michigan Medical Society*, 1940, vol. 39, pp. 116-117.

This is a report of a study of 65 schizophrenics from a purely neurological point of view. The author concludes that "in no case was there a significant grouping of neurological signs which would allow any conclusions to be drawn regarding focal lesions or a diffuse involvement of the brain. The type of signs which are found are for the most part non-specific and often seen in apparently normal individuals. No significant conclusion can be drawn from this fact other than that it is likely part of the general disturbance of the sympathetic nervous system known to be present in this disease."

General

BLACKBURN, J. H.: Patient a Personality Not a Machine. *Kentucky Medical Journal*, 1940, vol. 38, pp. 48-53.

This is a very gay and kindly article which, with the help of some illustrative stories in Negro dialect, calls attention to the fact that the internists and surgeons of certain sections of the country were never split so far apart in their medical thinking as to have viewed things so entirely "psychogenically" or "organically" as did some of their more sophisticated colleagues.

The prevalent attitude is one of kindly, amused tolerance that their colleagues have discovered the psychosomatic approach. There is, however, no very serious attempt to elucidate specific psychosomatic relationships, either from the point of view of

correlating specific psychic constellations with a somatic disease or specific somatic disease with the psychic factors.

BARROW, W. H.: Patient and the Art of Living; Approach to Psychosomatic Medicine. *Journal of the American Medical Association*, 1940, vol. 114, pp. 703-713.

This address to medical students will be reviewed in rather greater detail than some of the other literature because so many trends, both stated and implied, call for critical analysis.

At the outset the students are told of the usual mechanistic medical education and are informed how puzzling patients whose mental maladjustment expresses itself in physical symptoms are to physicians thus trained.

A definition of the group of patients is given as follows: "The chief complaint is usually physical, the subjective symptoms out of all proportion to the physical findings, and there is an underlying mental or psychic disorder based on constitutional inadequacy and on some environmental or circumstantial conflict."

It is stated immediately, "but where there is a physical complaint there is an underlying physical defect that needs attention." The proper approach is said to be one third psychiatric, one third physical, and one third "compassionate guidance in the art of life."

A statistical review of 250 patients in whom the psychic component was regarded as the root of the illness, of which the manifestation was, however, somatic, is then given. Thirty-seven per cent had chiefly gastrointestinal complaints, 17 per cent cardiovascular, 14 per cent malaise, 10 per cent "aches and pains," 7 per cent menopause symptoms, 5 per cent ear, nose and throat, 4 per cent hypertrophic arthritis, 3 per cent genitourinary, 3 per cent miscellaneous complaints. This section is interlarded with such comments as "the trouble is obviously due to sympathetic nervous system imbalance and calls for sedation, regular graduated exercise and reassurance in large doses."

"Malaise is a troublesome symptom be-

cause it is mental rather than physical. It is a protective mechanism against the demands of the outside world. But it can be labeled neurogenic in origin only by a system of elimination."

Under sub-title "History Taking" it is noted that "there is a rush by the patient to enumerate physical ailments and nothing is said of psychic factors, until the patient is subtly pressed for information." And then the statement is made, "I do not, however, believe that from the point of view of practical psychology most or even many mental problems can be laid at the door of sexual repression."

Under the heading of "Inadequate Equipment" it is noted that "this group has inadequate equipment to meet and handle the problems of everyday life. Trouble may often be traced back to hereditary instability, poor childhood environment, or early psychic trauma, but in any event, the adult psyche is a weak vessel."

Under the heading "A Paradoxical Situation," the statement is made that "Not only may marital conflict cause somatic disorders, but the converse is also true." While under that of "Business Worries" the author says, "It should be remembered that in these cases it is not long hours and hard work that cause the mental perturbation, but rather the factors of fear, and uncertainty, and indecision which nag at the individual and interfere with his normal mental rhythm."

Under the heading "Treatment" the author says, "There is a temptation to give placebos and to meet each new ailment with a new prescription as the patient expects the physician to do. There is, however, more constructive benefit in giving to the patient a little insight into the cause of the somatic complaint, and a little encouragement to subordinate the symptoms, if they are, as is common, too engrossing in interest or if the threshold to pain is too low or the tolerance poorly developed."

Under the heading "Psychotherapy" the attitude is that "the first requirement is complete insight by the patient into the working of his own instincts, emotions and sentiments, and understanding of his conflicts and maladjustments. The next step is

the working out of a practical solution of the problems presented."

Under the heading "Prophylaxis" the theme is developed that "a dominant central sentiment is important. With such a sentiment there is no conflict and indecision as situations arise. This sentiment must be organized around something that cannot be lost, preferably around an ideal or rule of personal conduct."

And finally, under the heading "The Art of Living," he concludes, "It is essential, however, if you would be a wise physician and not merely a medical mechanic that you see in your patients more than just a bit of anatomic and physiologic machinery, and study and stand ready to mend their backgrounds, their dominating central sentiments, their philosophies of life and their objectives."

The technique of liberal quotation has been used by the reviewer with the hope and expectation that the spirit and trends of the article are fairly reproduced so that they may be critically analyzed.

It should be said that it is a decided step in the right direction that students before graduation be introduced to the problems of psychosomatic medicine. However, from what has been quoted it is probably clear to the reader that much of what is contained in the body of the address tends to crystallize some of the older conceptions rather than to clear the pathway for the physician seeking an understanding and approach to psychosomatic interrelationships.

The definition of this group of patients given near the outset does not seem to this reviewer to be as clear as that published in the first issue of this journal. Rather one gets the impression that the definition given in the current article tends to maintain the artificial psycho-versus-somatic breach instead of stressing the interrelationship.

Throughout the article there is little emphasis on the major pathways of interest, of a) the fact that intrapsychic conflict can give rise to somatic symptomatology, b) the experimental work that supports this, c) the therapeutic value of this approach.

The emphasis on "neurogenic origin"

rather than on end organ, neurologic (both central and autonomic) and psychic interrelationships is a case in point.

Furthermore, it is hard to escape the undertone that this author does not fully accept the reality of repression. Throughout there is very little recognition of the crux of the psychic component itself, that the conflict is intrapsychic and that the patient is actually unaware of both the psychosomatic interrelationship and the intrapsychic conflict itself.

What is said under the heading "Business Worries" and "A Paradoxical Situation" are cases in point: It is fundamentally not a question of "marital conflict causing somatic disorders and the converse being true" but a question of intrapsychic conflict which may express itself in a marital disorder or in somatic symptomatology or both.

Especially in what is said under the heading of "Prophylaxis" about "the importance of the dominant central motive and its organization around an ideal that cannot be lost" one appreciates this lack of belief in the reality of the intrapsychic conflict.

There is also a corollary difficulty, which is inevitable when the importance of the relationship of the somatic symptomatology and the intrapsychic conflict is not fully credited, and that is the lack of emphasis on the working through process. It is more than "giving to the patient a little insight into the cause of the somatic complaint and a little encouragement to subordinate the symptoms . . ." that is required; it is a question of helping the patient to understand, emotionally as well as intellectually, the interrelationship between the symptoms and his own emotional life before one can expect a therapeutic result of real value.

WALL, J. H.: Psychiatric Approach to Problems in General Medicine. *Connecticut Medical Journal*, 1940, vol. 4, pp. 127-130.

The author calls attention to the fact that through the ages true physicians have always had the broader point of view. His purpose is to discuss some manifestations of emotional difficulties in general somatic systems in an effort to show how a psy-

chiatric approach can solve some of the problems confronting the man in general practice. He refers to the more intensive work on personality and specific types of somatic disturbance.

He then calls attention to an all too familiar pattern, that of the patient with gastro intestinal disturbance on an emotional basis who persuades the surgeon to operate with the consequence that the patient improves temporarily but the underlying cause, the emotional difficulty, is untouched. Eventually there is a recurrence of symptoms, an increased conviction on the part of the patient that there is a real though as yet undiagnosed physical cause for his difficulty. There follows a continual round of physicians, clinics, and operations, with an avoidance of psychiatric help and finally, chronic invalidism.

He also points out that though there is no royal road by which one may acquire a psychiatric approach to human problems and though we are still attempting to formulate methods of study and treatment, either a sound psychiatric orientation in the general practitioner, or failing this, collaboration with a psychiatrist will tend to ameliorate this type of mishap.

RIPLEY, H. S.: Psychiatric Consultation Service in Medical In-Patient Dept.; Function in Diagnosis, Treatment and Teaching. *American Journal of Medical Science*, 1940, vol. 199, pp. 261-268.

This article reports the workings of a psychosomatic service in a large urban hospital.

"The organization of the psychiatric consultation activity in the in-patient service of the hospital illustrates a plan which has proved practical for both the study, diagnosis, and treatment of the patients, and for the teaching of the house staff of the department of medicine and the medical student . . ."

"One full-time physician was assigned by the department of psychiatry to examine and treat patients with psychiatric problems on the medical pavilions. Consultations were at the request of the physician in charge.

"An analysis of the 218 patients seen dur-

ing a single year revealed the following six groups. Group 1, 12 per cent—those with minor problems of personality in which the physician feels that the advice of the psychiatrist may be of value from the mental hygiene standpoint," *i.e.*, persons who in the course of treatment for somatic disease revealed by their uncooperative attitude a personality problem that was not directly related to the somatic disease for which they were hospitalized.

"Group 2, 28 per cent—a group in which the relationship between emotional difficulty and the increased severity of his symptoms was seen by the patient. These were referred to the outpatient department and treated psychiatrically with marked improvement," *i.e.*, a group of psychosomatic cases in which the somatic component though prominent is still in the early functional phase and the psychic component is very conspicuous.

"Group 3, 32 per cent—A group whose physical illness was complicated by psychic features including such conditions as hyperthyroidism, migraine, peptic ulcer, hypertension, and asthma. These received combined treatment by the psychiatrist and internist," *i.e.*, a group of psychosomatic cases in which the somatic component is very prominent and is either in a much later functional phase than those in group 2, or has already become structuralized, and the psychic component is much less conspicuous though hardly less implicated.

"Group 4, 15 per cent—A group which on psychiatric examination was found to have organic cerebral changes, not severe enough to be diagnosed as a psychosis. The changes were related to arteriosclerosis, syphilis, alcohol, and pernicious anemia.

"Group 5, 9 per cent—A group which on psychiatric examination were found to be psychotic, including everything from schizophrenia to senile psychosis.

"Group 6, 4 per cent—A group which on psychiatric examination had no findings which could add appreciably to the understanding of the patient or contribute positive findings to the formulation of the illness."

In his summation the author says, "The untenability of the concept of duality

between mind and body becomes clear when attention is paid to the study of individual patients through the cooperative efforts of internists and psychiatrists."

There is very little for the reviewer to add except to note that this sort of set up is a fine one to advance the progress of psychosomatic medicine and offers great advantages to both the physicians and patients. It shows in many ways what can be done by a cooperative effort between psychiatrists and internists, not the least of which is that in only 4 per cent of the cases in which a consultation was requested of the psychiatrists was nothing positive added to the understanding of the patient's illness.

It should not be too much to expect both that this procedure will serve as a model for other large urban hospitals, and that in the future a great deal of light will be thrown on the further elucidation of psychosomatic interrelationships from this type of cooperative source.

GORDON, R. G.: *Psychosomatic Medicine. Edinburgh Medical Journal*, 1940, vol. 47, pp. 16-31.

This article deals broadly with the general discovery, or better, the modern rediscovery of psychosomatic medicine and refers to several aspects of the story.

One aspect that is constantly stressed is the process itself, *i.e.*, the process by which one kind of energy is transferred into another. "Alkan (1930) first clearly stated the method whereby emotional states might produce organic disease through the autonomic nervous system. He postulated that intrapsychic conflicts working through the hypothalamus may be expressed by spasms of smooth muscle which secondarily leads to anemia of an organ, stasis, muscular hypertrophy, or infection. As a result of these secondary factors organic changes result in the visceral or somatic structures, which of themselves, as terminal events, are irreversible and constitute the organic disease."

Another aspect that is stressed is the experimental production of somatic manifestations by the hypnotic reproduction of painfully toned emotions.

Specific conditions such as asthma and

mucous colitis are not discussed because "they have long been recognized as essential neuroses and the frequency of their psychogenic origin is not in dispute."

This seems to the present reviewer to be a somewhat oversimplified statement of the actual state of affairs and the sort of attitude which tends to maintain the artificial psycho-versus-somatic dichotomy, though perhaps it is less dangerous at this time when the psychic component of both asthma and mucous colitis is the subject of a great deal of serious study.

WITT, G. F. and CHEAVENS, T. H.: Psychiatric Contraindications to Surgery. *Texas State Journal of Medicine*, 1940, vol. 35, pp. 681-684.

This is a psychiatrist's warning to surgeons that "a human being as such, should be regarded as a reactive unit." The emphasis is not along the major pathway of trying to elucidate psychosomatic interrelationships but rather on some of the mishaps that occur when the surgeon permits himself to be beguiled and leave the major pathway in search of a short cut to health by disregarding the psychic component. The author's conclusions call attention to the nature of these mishaps and how they may be avoided. The conclusions are as follows. "1) Careful surgical diagnostic procedures will often preclude the accidental operation on a patient who is fundamentally psychiatric. 2) Careful psychiatric examination may prevent haphazard surgery on the chronic patient and may prepare the surgeon for intelligent future care where emergency procedures have been necessary. 3) Surgery and psychotherapy should not be confused. In all probability one may say an operation is never good psychotherapy. If good results are obtained, they will probably be fleeting with an aftermath of most unsatisfactory development. 4) Surgery done at the insistence of the patient 'to satisfy the patient' in the absence of objective evidence of such need, is usually dangerous, often inexcusable, and it may be added, in the light of personal observation, frequently unavoidable. 5) Observation of the patient as a human being, knowledge of his back-

ground, attention to small, often insignificant details, while time consuming, may serve the surgeon well where psychiatric consultation is not available . . ."

In the body of the article it is also stated that "very often there is sufficient positive evidence of psychiatric disorder to throw great doubt on the validity of the patient's symptoms insofar as their surgical importance is concerned." It is gratifying to see this last stated in positive fashion because it is not so very long ago that the psychic component in these cases was recognized, if at all, only on the basis of exclusion diagnosis.

The fourth point in the author's conclusions calls for some comment. "Surgery done at the insistence of the patient . . . in the absence of objective evidence of such need is usually . . ." That is, of course, the phase in which somatic disturbance has not yet become structuralized. This is an especially crucial phase and one that has for some time caused considerable confusion.

The surgeon with no psychiatric orientation but with good "purely surgical judgment" has in the past refused to operate and has taken the point of view that there was nothing the matter with the patient, an attitude that has been roundly criticized. It has left the patient frustrated both from the reality point of view, because there really *is* something the matter, and also from the point of view of frustrating the unconscious attempt to short circuit the process by refusing to sanction the patient's unconscious translation from psycho to somatic.

The surgeon with no psychiatric orientation and with less good "purely surgical judgment" was often beguiled by this situation into exploratory procedures which tended to fix the patient's attention on the explored areas. They sanctioned the short-circuit and the result was a patient with the conviction that there was something organically wrong, but that the surgeon did not find it; and often the patient's whole existence from that point on became a search for a surgeon who would find the organic trouble and repair it.

These cases are, of course more difficult

for succeeding surgeons to recognize because each new operation carries with it the implication of possible adhesions from the last. They are the not unfamiliar scar-museums that have been commented on in recent psychosomatic, psychiatric and surgical literature.

PEARSON, M. W.: What Shall We Do with the Psychoneurotic? *General Practitioner's Medical Association*, 1940, vol. 31, pp. 46-51.

This article is characteristic of a certain type coming from the sincere and troubled general practitioners who, after many years of practice have found "the army of patients whose distress far outweighs their physical disability," and whose complaints are unphysiological, and who are as highly susceptible to treatment as they are resistant to cure. The author asks, "is it any wonder that we are often puzzled, and at our wit's end to know what to do for these people—not sorry to pass them over to whomever will take them? . . ." And then says, "We general practitioners may often escape the tedium by contact with the more tangible problems of our job, but the poor psychiatrist, God help him, is condemned to spend all his days grabbing his diagnoses out of the air and trying to piece together the jig-saw puzzles continually dumped upon his doorstep."

The author lists six "Don'ts" in the handling of psychoneurotics, each of which he admits having violated at some time; they are worthy of repetition and interpretation because they are indicative of the more frequent ways in which the profession has in the past unwittingly played into the hands of the neurosis. 1) "Don't operate. . . ." Don't allow incidental pathology to become a fixation point for the whole psychic disturbance. 2) "Don't tell the patient he has disease or weakness of the heart." A recognition of the frequency with which we have aided and abetted in the transformation from anxiety state to anxiety hysteria. 3) "Don't tell the patient you suspect 'growth' unless you insist on an immediate investigation to prove or disprove your suspicion." Don't supply a nebulous but threatening base to the free

floating anxiety from which it will later be exceedingly difficult to dislodge it. 4) "Don't tell the patient, in so many words, that there is nothing the matter with him, he will never believe you." A recognition by the practitioner that even though there is either no or minimal organic pathology, the patient knows there *is* something the matter with him, though he will stress the somatic side. 5) "Don't fail to show a sympathetic—but not too sympathetic interest in the patient's story." A recognition that while it is very important for the practitioner to understand the subjective nature and meaning of the patient's complaint it is also important not to confuse the patient by misleading him into believing that a) there is no difference between the objective situation and the patient's subjective appreciation of it, or that b) he has confused the physician as badly as he himself is confused on that score. 6) "Don't restrict the diet. The majority of neurotics have already dieted and many are half starved, but don't know it, being afraid to eat," a recognition that it is equally important not to indict an innocent object such as food any more than a non-offending organ or tissue as the cause of the illness.

And then comes the suggestion that "We must give medicine of some kind, for a time at least, to nearly every psychoneurotic or he is not satisfied. The various forms of physiotherapy may also be employed for a time and for the same reason." In other words, he suggests, we must make some concession to the neurosis, less pernicious than the other types that were made unwittingly but so much more subtly beguiling and reinforcing that it will complicate the task of anyone later attempting to deal with the octopus.

And while admitting "that we have not the time or the patience for more than medication and physiotherapy we should realize that these things as a rule, are only incidental and we can try in an occasional case, at least, to work in at each visit, explanation, encouragement, suggestion and some psychoanalysis, until we get the whole picture and obtain the confidence of the patient. But when we have obtained the confidence of the patient in our ability

to help him, we have only made a beginning. If we do not succeed in restoring a patient's confidence in himself, we shall not accomplish permanent benefit for him."

And finally, "when we find we are getting no response, we should make an honest effort to persuade the patient to seek the advice of some reliable psychiatrist who by his different personality or method may succeed where we, for want of time, tact, or skill, have failed."

It is this double-barrelled difficulty, inherent in this type of attitude, that those interested in psychosomatic medicine will have to recognize, *i.e.*, the simultaneous admission that while the general practitioners have neither the time nor the patience nor the methodology for a really constructive approach they will continue to treat this type of case without cooperation with a psychiatrist until they finally find they are getting no response.

JOHNSON, A. M.: Vertigo as Primary Manifestation in Anxiety Neurosis. *Illinois Medical Journal*, 1940, vol. 77, pp. 86-89.

This article reports a case of vertigo in a patient who, on careful examination by neurologists and psychiatrists was found to have a repressed rage which when worked through resulted in the disappearance of the vertigo, albeit, with the appearance of other anxiety symptoms which require further treatment.

The author raises the question whether there may not well be a great many cases of Ménière's syndrome that are definitely on a functional basis as well as a great many primarily on an organic basis.

To this reviewer this again seems unnecessarily to be putting the emphasis on the organic-versus-functional thought pattern, though the author does suggest the more dynamic approach. The present view is that vertigo is caused by changes in the vestibular organs, and further that these are caused by vaso-motor disturbances.

The next step, and the one which the author suggests, is that it is quite possible that the vaso-motor difficulty can result from either direct organic damage or from psychic impulses acting via the central and autonomic nervous systems.

The case reported demonstrates that this latter does occur, and many other cases have shown the vaso-motor difficulty to be the result of gross change, such as hemorrhage, thrombosis, or pressure from local neoplasm.

To sum up, the present status of the problem is that either direct, gross organic damage, or psychic impulse can act on the vaso-motor supply to the vestibular organs, and that each individual case of Ménière's syndrome has to be investigated individually to see what the primary disturbance is in the particular case.

ALEXANDER, G. H.: Anorexia Nervosa (With Emphasis on Psychotherapy). *Rhode Island Medical Journal*, 1939, vol. 22, pp. 189-195.

This article, which reports the successful treatment of a case of anorexia nervosa by attention to the psychic component after failure by a purely somatic approach, falls into the group of those that are content to point out that there is a causal relationship between certain types of somatic disease in which the underlying organic pathology is not commensurate with the somatic symptomatology and certain psychic factors, which are in the foreground.

It also points out that generalized psychotherapy, without deep or detailed analysis, is often sufficient to halt the somatic disturbance and actually, by allowing the patient to work through some of his emotional problems to bring about a reversal toward health.

THROCKMORTON, T. B.: Psychotherapy in General Medicine. *Urological and Cutaneous Review*, 1940, vol. 44, pp. 168-173.

This belongs to the growing group of articles by general practitioners which in the most general terms call attention to the fact that the conscientious and kindly practitioner has always known and respected the psychic component in disease. It is kindly in tone and very general in nature, and by implication at least, serves the purpose of chiding very mildly both the physicians and the habits of mind which led to the establishment of the dichotomy.

HOWARD L. WERNER

BOOK REVIEW

WITMER, HELEN LELAND: *Psychiatric Clinics for Children*. The Commonwealth Fund, New York, 1940. 437 pp., \$2.50.

For a book which contains so much solid "meat" and so many pithy comments it is difficult to write an adequate review. Its thorough survey of child psychiatry and child guidance in this country as well as its keenly critical analyses should be read by every one interested in this field. A rather extensive review is attempted here in the hope that it may lead to a study of the book by some who might otherwise pass it by as just another volume in the field of child psychology.

The three chapters of Part I, dealing with the background of clinical child psychiatry in the United States, include discussions of 1) the influence of Adolph Meyer, 2) that of the Freudian school, and 3) a general historical survey of the early clinics. This reviewer finds it difficult to accept the author's account of the beginning of child psychiatry clinics. Even granting the importance of Adolph Meyer, and the whole Meyerian school of thought, to American psychiatry one has the feeling that many other people and factors played important rôles in the development of *child* psychiatry. The book makes no mention of the significant contributions of some of the earlier pediatricians like Jacobi or Bowditch and gives too little credit to some of the other psychiatrists and psychologists whose work and writings cover the same period. Dr. Witmer seems on firmer ground in chapter III when she presents a more adequate picture of the actual "evolution of psychiatric clinics for children."

Part II consists of a survey of state-financed clinics. Its 275 pages are full of interesting and relevant material, adequately and fairly appraised. The author is to be praised for her honest and critical analyses of just what these clinics are or are not accomplishing.

In Part III Dr. Witmer discusses the "principles for future programs" in a clear, concise and logical manner. The first of the five chapters in this section contains an excellent exposition of the complex problems involved, concluding "that a first step toward clarification is made when a clinic can say specifically what it considers its main objective." The next three chapters deal with the many requirements involved in each of the three most likely objectives of child psychiatry clinics. These are, 1) the prevention of psychosis and crime; 2) service for the feeble-minded and neurologically disabled; and 3) child guidance as a means of promoting mental health. Concerning the first Dr. Witmer concludes that "in both cases (psychosis and crime) a psychiatric program can only aim at the 'treatment of an existing unhappiness rather than at prevention of some impending disease' or misconduct." In discussing the second objective the author stresses the need for special training for psychiatrist, psychologist, and social worker if the clinic is to contribute any permanent or significant service to the community.

Chapter XII contains an unusually able summary of the difficulties which beset the modern child guidance clinic. Any one who has had experience with such clinics will enjoy the honesty and the thoughtfulness of this discussion. As an example I may quote from a thorough presentation of the conflict between the urge for social reform and that for help for the individual. In this regard Dr. Witmer remarks that "the aim of social reformation (of the individual) through clinic treatment thus tends to be self defeating." She concludes that "the clinic must therefore stand outside the network of regulative institutions and seek recognition in the community as the agency of the individuals who want its help."

There follows a most interesting section on the different schools of thought concerning treatment. Dr. Witmer's discussion of "the traditional mental hygiene method" of

"modifying the environment" is particularly illuminating in view of her earlier remarks concerning the contributions of the Meyerian school to the development of child psychiatry. While the author offers no solution to the conflict between this philosophy of treatment and that which urges helping the patient to make his own adjustment to his environment as it is, the reader will find her presentation instructive as well as interesting.

In the final chapter Dr. Witmer summarizes and draws together all her material relevant to the organization of effective psychiatric service for small communities. She points out that "no state has as yet undertaken a comprehensive program for promoting the mental health of children." She adds, "perhaps in the present state of knowledge, practice, personnel, resources, and public attitudes toward psychiatry it is just as well this is so." The discussion of essential prerequisites which follows is clear and full of common—or perhaps one should say uncommon—sense. There is no attempt to set up specific recommendations nor any drawing of final conclusions other than "that mental hygiene, to be most effective, must be reflected in a way of life in the Community as a whole."

ALFRED H. WASHBURN

BOOKS RECEIVED

- KOPELOFF, NICHOLAS: *Bacteriology in Neuropsychiatry*, Charles C Thomas, Springfield, 1940.
 MASLOW, A. H. and MITTELMANN, BELA: *Principles of Abnormal Psychology*, Harper & Brothers, New York, 1941.
 SALTER, WILLIAM THOMAS: *The Endocrine Function of Iodine*, Harvard University Press, Cambridge, 1940.

NOTE

Commonwealth Fund Fellowship in Penal Psychiatry, 1941-1943. A fellowship in penal psychiatry in the University of Penn-

sylvania, provided by the Commonwealth Fund is now available. Term of fellowship—2 years. Stipends, \$2400. First year; \$2800 second year. Minimal qualifications specify graduate physician not older than 35, having accredited internship and at least two years of acceptable psychiatric training. Address inquiries to Philip Q. Roche, M.D., Secretary, Committee on Medico-Legal Fellowships, 255 S. 17th Street, Philadelphia, Pennsylvania.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUGUST 24, 1912, AND MARCH 3, 1933

OF PSYCHOSOMATIC MEDICINE published quarterly at Menasha, Wisconsin for January 1, 1941.

State of Connecticut } ss.
 County of New Haven }

Before me, a Notary public in and for the State and county aforesaid, personally appeared Dr. Walter R. Miles, who, having been duly sworn according to law, deposes and says that he is the Business Manager of the Psychosomatic Medicine and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher, National Research Council, Washington, D.C.
 Editor, Editorial Board

Managing Editor, Dr. Flanders Dunbar, 2 E. 163rd St., Room 445, New York, N.Y.

Business Manager, Dr. Walter R. Miles, 333 Cedar St., New Haven, Conn.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.)

National Research Council, Washington, D.C.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.)

None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company, but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the twelve months preceding the date shown above is (This information is required from daily publications only.)

Sworn to and subscribed before me this 13th day of February, 1941.

Walter R. Miles
 G. Sarah Green
 (My commission expires February 1, 1945.)